

ON THE TRACK OF RAILROAD LOGGING HISTORY

A Contextual History for Railroad Logging in California

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CONTENTS

Preface.....	3
Acknowledgements	4
Maps	5
 I Railroad Logging in California: Historical Background	10
Physical Environment	10
Early Development of the Timber Industry	12
The Introduction of Railroads to the Logging Industry	13
Economic Factors	14
Railroad Technology	15
Social/Cultural Environment	18
Conclusions	19
 II The Research Design	21
The Process	22
Research Domains	22
Economics	22
Technology	23
Environment	25
Social/Cultural	26
Footnotes	28
References	29
Illustrations	38

APPENDICES

A. Glossary and Site Definitions	47
B. Site Characteristics and Research Potential	68
C. Historic Railroad Logging as a Cultural Resource	70
D. Archival Sources	75
E. Railroad Logging Systems on Pacific Southwest Region Forests	76

PREFACE

A team of Forest Service cultural resource managers, including anthropologists, archaeologists, and historians, produced this design. It is a working document and will be updated as new information becomes available.

Railroad logging refers to operations that used locomotives and other rolling stock, railroad lines, and spurs to remove timber from forested areas. Around the turn of the century, railroad systems provided the primary means of transporting logs from the woods to the mills and lumber to the market place (Maps 3 and 4). In California, railroad logging left a conspicuous mark on the landscape, particularly on lands that are now National Forests (Maps 1, 2, and 3). Substantial evidence of the cutting and transporting of timber remains in the form of railroad grades, trestles, logging camps, skid roads, mills, and logged-over landscapes (Appendixes A and B). The Forest Service is responsible for inventorying and managing these cultural properties. This design is intended to assist in this identification, evaluation, and management process, and to provide guidance for future research.

This report is also the basis of an agreement with the Forest Service, State Historic Preservation Office, and the Advisory Council on Historic Preservation regarding the treatment of historic railroad logging properties on Region 5 National Forest lands.

The first section of this design provides a brief chronology of the railroad logging industry in California. In the second section, important developments are discussed in each of four areas: economics, technology, environment, and social/cultural. This historical background provides a context in which to view past research efforts and a basis for the research objectives, which follow. In the Research Domains, regional research questions are defined for each of the four areas.

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We would like to thank the members of the first Railroad Logging Group-- Pam Conners, Stephen Fosberg, Dorothy Goddard, Winfield Henn, and Dick Markley--for charting the course of this design. Linda Lux was responsible for the editing and production of this latest edition.

Reviewers' comments on this and previous drafts were both helpful and substantive. The various philosophical perspectives provided fuel for lively debate and improved the outcome of the final report.

MAPS

RAILROAD LOGGING IN CALIFORNIA: HISTORICAL BACKGROUND

Physical Environment

Physiography, climate, and soils determine where certain species grow as well as the density of tree stands. Because the distribution of timber species affected the location, technology employed, and the costs involved in commercial logging, it is important first to review these key environmental factors.

Geography

California has four major timber-producing areas: the redwood-dominated northern Coast Range, the Douglas-fir regions of the Klamath Mountains, and the pine-timber regions of the Cascade Range and the Sierra Nevada. Noncommercial forests and woodlands include portions of the southern Coast Range, the foothills surrounding the Central Valley, the sub alpine areas, the Modoc Plateau, the desert border foothills, and the Transverse and Peninsular Ranges of southern California (Davis 1983:59).

The Coast Range begins near Point Conception and extends northward, west of the Trinity and Klamath Mountains to the Oregon border. The Coast Range is composed of steep slopes broken by secondary ridges. The principal drainages are at low elevations, and narrow ridges continue at uniform elevations for long distances.

The Klamath Mountains are east of the Coast Ranges and west of the Cascades. One of the wettest and most sparsely settled regions of California, the Klamath Mountains vary in elevation from 2,000 feet along the South Fork of the Salmon to 6,000 feet in the Yolla Bolly mountains. The Klamath River bisects this region in a north/south direction. The mountains are composed of old metamorphic rock with extensive igneous intrusions (Durrenburger 1968:8).

The Cascade Range extends northward from the Feather River area into Oregon and Washington. The Cascades are composed of towering, volcanic peaks with angular volcanic flows modified by erosion.

The Sierra Nevada, ca. 400 miles long and 70 miles wide, runs from 50 miles below Lone Pine in the south to Mt. Lassen in the north. Major east-west drainages cut deep canyons, and between these major streams are high, timbered plateaus and ridges. The northern Sierra is relatively lower in elevation than the southern portion of the range. The western slopes are more uniform and continuous than the abrupt, steep slopes of the east side.

Annual precipitation in these timber-producing regions varies from 120 inches along the northern coast to less than 5 inches in the southeast. Forests that once covered nearly 46 million of the state's 100 million acres have been reduced to 40 million acres. Almost 16 million acres, half of which is in National Forests and half privately owned, are productive and available for harvest (Davis 1983:59).

Distribution of Commercial Tree Species

Between 1840 and 1920 the primary tree species harvested in the forests of California included: Douglas-fir (*Pseudotsuga Menziesii* (Mirb.) Franco), sugar pine (*Pinus lambertiana* Dougl.), ponderosa pine (*Pinus ponderosa* Laws.), Jeffrey pine (*Pinus jeffreyi* Grev. & Balf.), and coast redwood (*Sequoia sempervirens* (D. Don) Endl.; Berry 1917:3). Other species of less commercial importance, included the western white pine (*Pinus monticola* Dougl.), lodgepole pine (*Pinus contorta* Dougl.), red fir (*Abies magnifica* A. Murr.), white fir (*Abies concolor* (Gord. & Glend.) Lindl.), and incense cedar (*Libocedrus decurrens* Torr.).

The Mixed Evergreen Forest of the northern Coast Range is best known for its stands of redwoods extending about 400 miles northward from Monterey County to the Oregon border. Redwood, unlike most conifers, reproduces by sprouting. The species grows rapidly and produces a valuable, durable, and colorful wood. Considered the world's tallest tree, the redwood is protected in several publically owned preserves, as is the related giant sequoia of the southern Sierra Nevada. Other species of the northern Coast Range include Douglas fir, tanoak (*Lithocarpus densiflora* (Hook. &

Arn.) Rehd.), and madrone (*Arbutus menziesii* Pursh.), and in the north a limited number of grand fir (*Abies grandis* (Dougl.) Lindl.), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), Sitka spruce (*Picea sitchensis* (Bong.) Carr.), red alder (*Alnus rubra* Bong.), western redcedar (*Thuja plicata* Donn), and Port-Orford-cedar (*Chamaecyparis lawsoniana* (A. Murr.) Parl.). The latter produces a fragrant, durable, finely textured wood used in ship construction (Davis 1983:59).

In the higher northern elevations, redwood gives way to Douglas fir and several oak species, and to the east, sugar, ponderosa, and Jeffrey pines. California Douglas-fir, currently third in importance after pine and true fir in terms of productive forestland, was earlier regarded as inferior to the timber of the Pacific Northwest. Since the 1930s, it has increased in value and it now supplies more timber than any other California species (Davis 1983:59).

The northern inland ranges, including the Klamath, the Cascade, and the Sierra Nevada, support a Mixed Conifer Forest of varying combinations of Douglas fir, ponderosa and sugar pine, white fir, incense cedar, and California black oak (*Quercus kelloggii* Newb.). Ponderosa pine, the dominant species in the Mixed Conifer Forest, was second only to redwood in its importance to the lumber industry of the early 1900s. Along with Jeffrey pine, which grows in relatively pure stands on the east slopes of the Sierra, ponderosa pine was marketed as California white pine until litigation in the 1920s forced a name change. The tallest pine species, sugar pine, was favored over ponderosa pine for lumber because it is a white pine, with properties similar to eastern white pine. It was an important source of shakes and shingles during the nineteenth century. Later, the soft, easily worked wood was used for cabinets and industrial stock. The durable incense-cedar provided early pioneers with fence posts, rails, shakes, and shingles, although the wood was undesirable for lumber because of brown pocket rot in over mature trees.

At elevations above the ponderosa and sugar pine stands are forests of red fir, white fir, lodge pole pine, and Jeffrey pine. The red and white true firs are second only to pines in the number of productive acres. However, firs were initially considered inferior as commercial lumber. In the early 1920s through the 1930s, the Forest Service required lumbermen on National

Forests to cut and remove true firs. Because the market for this lumber was minimal, the logs were often left to rot or burned (Davis 1983:59).

South of the Santa Cruz mountains, the Mixed Evergreen Forest of the Coast Range becomes a Mixed Evergreen-hardwood Forest of tanoak, madrone, and live oak (*Quercus agrifolia* Nee), with limited amounts of Coulter (*Pinus coulteri* D. Don), ponderosa, knobcone (*Pinus attenuata* Lemm.), Jeffrey, and sugar pines, and Monterey (*Pinus radiata* D. Don) and bishop (*Pinus muricata* D. Don) pines along the coast and fir in the mountains. In the Transverse and Peninsula Ranges there are scattered stands of the Mixed Conifer Forests on the higher ridges. Bigcone-spruce (*Pseudotsuga macrocarpa* (Vasey) Mayr) in association with Coulter and Jeffrey pines, replaces Douglas-fir. The sub-alpine forests consist of lodgepole pine, whitebark pine (*Pinus albicaulis* Engelm.), and mountain hemlock (*Tsuga mertensiana* (Bong.) Carr.), with stands of western juniper (*Juniperus occidentalis* Hook.), quaking aspen (*Populus tremuloides* Michx.), and western white pine. Blue oak (*Quercus douglasii* Hook. & Arn.) and Digger pine (*Pinus sabiniana* Dougl.) are found scattered in the foothill woodland forests above the Central Valley and at the lower elevations in the Coast Ranges. The Modoc Plateau and desert border area east of the northern Sierra Nevada consists mainly of western juniper, but south of Lake Tahoe singleleaf pinyon pine (*Pinus monophylla* Torr. & Frem.) grows in association with junipers (Davis 1983:60).

Early Development of the Timber Industry

Early in the development of the lumber industry in California in the 1800s, timber was acquired primarily for local building purposes such as missions, presidios, barracks, and residences. Redwood was used by the Spanish for constructing missions in the San Francisco Bay Area, and in 1812, by the Russians for the construction of Fort Ross (Davis 1983:60). Oak was used as fuel wood and for the manufacture of furniture, religious art, barrels, yokes, saddle parts, and vats for the production of leather and tallow.

Through the early 1820s there was no large-scale exploitation of timber in California (Steer 1948). However, by the 1830s, overseas trade increased and a brisk export of lumber products developed. Redwood was shipped to settlements in southern California and Hawaii (Davis 1983:60). China and

South America also provided Pacific Coast manufactures with new markets. The Hudson's Bay Company was probably the first commercial firm to develop a regular foreign trade of west coast timber products (Cox 1974:8). During the late 1830s, Thomas O. Larkin entered the business, furnishing products to Honolulu, Mazatlan, New Helvetia, and buyers in Valparaiso, Chile (Cox 1974:17).

The discovery of gold in 1848 significantly changed the manufacturing and marketing of lumber products in the West. Local demand for timber products increased because mining required massive amounts of poles and lagging for tunnels and shafts. San Francisco became the major trade center for regional and world markets. Between 1849 and 1850, overproduction quickly glutted the local market around the San Francisco Bay Area; however, small lumber companies, operating in the foothills of the Sierra Nevada, continued to supply the growing mining population.¹

During the 1860s with the construction of railroads and the opening of new mining frontiers, the lumber market continued to expand. Completion of the transcontinental railroad tied the Far West to the Great Basin, Midwest, and East, providing an economical means of transporting goods and people over the Sierra Nevada. With the new technology and a growing demand for railroad services, construction proceeded at a rapid rate throughout the nation.² Between 1869 and 1874 the Southern Pacific Railroad built lines through the San Joaquin Valley.³ In 1876 they reached Mojave, and connected with lines leaving Los Angeles. Completed in 1888, the California and Oregon Railroad linked central California with the major population centers of Oregon (Abdill 1959:20). By the 1880s common carrier lines transected the state, linking regions, which had previously been inaccessible by major transportation routes.

By the turn of the century, timber stands had been depleted in the Northeastern and Eastern regions of the United States. This resulted in an infusion of capital into the Pacific Coast lumber industry. At the same time, the national economy was expanding and the demand for goods and services diversified and increased. People looked to the West for cheaper, more abundant forest products for use in homes, factories, and shipbuilding.

The Introduction of Railroads to the Logging Industry

Lumber companies were limited to harvesting the timber immediately surrounding their mills, and once they had depleted this timber, they had to relocate. In order to ensure a continuing supply of harvestable timber, companies had to acquire large tracts of land throughout the state. The industry needed an economical, efficient means of penetrating forested areas and transporting logs over long distances. Waterways had provided transportation in some areas but proved impractical in mountainous regions. By the latter part of the nineteenth century, oxen, horses, and mules, wood flumes, chutes, steam donkeys, and incline railroads had all been used.

Extractive industries such as mining had been using railroads for transporting materials long before the lumber industry. But the first successful attempts to adopt the technology to logging were made in the 1860s in the West. These early railroad-logging systems were crude, but they soon proved to be more economical than other forms of transportation for several reasons:

1. Independence of water transport--Railroads made large areas of timber accessible which would not have otherwise been logged. Areas lacking streams for floating logs, or potential manufacturing and shipping facilities far from water outlets were now accessible by railroad lines and spurs. This was probably the primary reason for the introduction of railroads into logging in California.
2. Independence of weather conditions--Rail transport rendered a logger practically free from weather considerations. Snow, as a bottom for hauling, or floodwaters, to float logs, were not needed. Railroads operated year-round with only occasional interruptions due to heavy rain or snow. Companies which continued to use flumes for transporting lumber to common carrier railheads, continued to depend on weather conditions, although not as greatly.
3. Flexibility in terms of market conditions--Railroad transport did not require a manufacturer to anticipate market conditions months in advance. Logs could be cut and hauled to the mill on short notice. Special requirements such as longer timbers or a heavier cut could be readily met.

Operations could be temporarily shut down during a lull in the market without leaving large quantities of logs in the forest subject to damage from fire, insects, or sap stain. An operator could turn over finances at more frequent intervals without investing large sums in advance.

4. Fewer logs lost--Relatively few logs were lost in transport when compared to methods such as water transport.

The glory-days of railroad logging lasted nearly three decades, from the 1890s through the early 1920s. In 1884, the lumber industry journal *West Shore* already reported that logging railroads and steam engines were replacing skid roads and ox teams (Cox 1974:209). By 1900 most logging firms relied to some extent on railroads for hauling and marketing their products. The companies that could move timber the quickest to meet the supply demands, stood to make the most profit.

Economic Factors

Railroad logging was first and foremost an economic venture. Lumber companies strove to maximize profits and railroads could increase their ability to do so. However, the fact was that investment was a gamble, and more lumber companies failed than succeeded. Several important economic factors were involved in the success or failure of railroad logging investments.

Construction of railroads called for a large initial outlay of capital. Even for well-established companies this could be difficult and involved a certain amount of risk (Cox 1974:211). Some firms purchased obsolete or inferior equipment in an attempt to cut costs, while others were unable to pay back their creditors and eventually went bankrupt. Railroad logging equipment needed constant repair and maintenance, and parts were hard to find--this, too, was expensive.

The amount of time it took to build a railroad was crucial. It could take several years to construct a line into the timber. If the lumber market had weakened during that time, the project could end in disaster. A company could deal with this in several ways. A firm could either build a grade, one section at a time, without large financial outlay, or quickly blast through in a

matter of months. In the latter case, the poor construction usually required rebuilding or modification at a later date. Some companies in the central Sierra built mills in the woods first and stockpiled lumber. When the railroad was complete, they turned a quick profit.

Operations were sometimes restricted by an inability to control, by ownership or lease, large blocks of timberland. In 1891, this problem was compounded by the establishment of the Forest Reserves, which took out of public domain large tracts of land. Some companies went so far as to purchase the land surrounding their competitors in order to stop further expansion.

The lumber market and production costs were constantly changing. New markets seemed to open almost daily, making competition fierce. Sound economic decisions were not always easy to make. Lumber prices, which influenced a logger's decisions on what species to cut and the volume to harvest, were constantly fluctuating. The dollar value of wood was measured in board feet per million, and in a good year a firm could make hundreds of thousands of dollars. When the market was down, they could lose thousands. However, lumber prices were relatively stable when compared to the escalating production costs. In the long run mechanical improvements such as logging railroads undoubtedly increased profits. However, the initial capital outlay must have been difficult for businesses that had to finance these technological innovations with their current earnings.

With an unstable, highly competitive market, lumber companies had to develop sound production strategies to overcome periods when the market for timber was weak. These strategies included purchasing new, more advanced equipment, expanding their railroad systems, selling stocks and bonds, and merging with other companies to consolidate land holdings. However, the company dependent on railroad transport generally fared better because of its ability to ship products quickly and efficiently. The advantages of railroad logging-- increased accessibility, independence of weather conditions, production freedom, decreased loss or damage of logs-- made it possible to respond to an ever changing market (Bryant 1914:248).

Railroad Technology

Railroad Construction

Construction of a typical railroad grade consisted of clearing the right-of-way, blasting stumps, grading, and laying track. For temporary lines it was quicker and cheaper to construct cribbing or trestles rather than to use fill. These were built of either rough or milled timber, although milled timber was preferred. Generally the railroad ties were sawed at the nearest mill and hauled by flatcar to the grade under construction. Standard rails were thirty feet in length. In most cases, after the timber was removed and the railroad grade was abandoned, the relay rails, as they were called, were taken up and used on another grade.

Short Line Railroads--From the beginnings of the western lumber industry, lumber companies and common carrier railroads battled over freight rates, demurrage, rights-of-way, and car shortages (Adams 1961:21). The Southern Pacific Railroad had a strong hold over freight rates in California until other lines opened up in the 1920s and 30s. Lumber companies began to build their own common carrier systems connected to their narrow gauge operations. These small or short line railroads, now known as Class Three Lines, provided the necessary links between the lumber companies' local communities. During the early 1900s over 1000 short line railroads were in active use in the United States (Levine, et al. 1982). However, they were plagued by constant turnover, consolidations, and changes in size, name, and ownership.⁴

Logging Spurs--Logging spurs were temporary lines, which extended into timber areas and cost much less than main lines. The complexity and number of spurs depended upon topography, maximum yarding distance, amount of chute hauling, and stand density (Berry 1917:46). The maximum incline and allowable curvature depended on the type of locomotive used and the expected weight of the load (Berry 1917:48).

Right-of-Way--Construction of short line railroad or narrow gauge spurs depended on obtaining the necessary right-of-way. The right of loggers to build railroads across the lands of others was not recognized by the courts except where the roads had been chartered by the state (the California the State Railroad Commission was created in 1911). With state charters the right of Eminent Domain was granted. Through condemnation proceedings a

line could be built across private holdings, and the owner could be compensated financially (Bryant 1914:250).

For a number of reasons, many railroad companies did not incorporate even though this might have facilitated obtaining right-of-ways. The incorporation of a railroad subjected it to regulations governing hours of labor for crews, use of air brakes, height of drawbars on the equipment, filing of tariffs, and submission of reports to the State Railroad Commission (these reports have, incidentally, provided valuable information on the particular railroad systems). Where the owner of a non-chartered railroad desired right-of-way, the land could be purchased at private sale (Bryant 1914:251). A less expensive alternative was to lease the right-of-way from the owner for the period needed to remove the timber.

Rail Gauges--The choice of standard or narrow gauge rails for logging operations depended on the size of the operation, the topography, and the amount of capital available for investment (Bryant 1914:249). Most railroad logging systems employed narrow gauge rails because they were cheaper to construct. The width of cuts and fills was narrower, construction of sharper curves was possible, the cost of laying track was less, and the initial expense for rolling stock was not as great as for standard gauge (Bryant 1914:249). However, because most common carriers were standard gauge, standard gauge connecting lines had to be built between the sawmills and the main lines. By the turn of the century, narrow gauge railroads accounted for more than 16,000 miles of track (Turner 1971).

Heavy Equipment

Steam Donkeys--Prior to the 1880s, oxen or mules from the woods to the rails hauled logs where water conveyance was not available. But in 1888, John Dolbeer received a patent for a steam donkey engine. Similar equipment had been used in shipyards before Dolbeer's patent, but not for yarding logs in the woods. Dolbeer's steam donkey when placed on a set of wood skids could yard logs up to 1500 feet from the landing where they were loaded onto the flatbeds. Soon after it was patented, the steam donkey became the principal means of conveying logs from the woods to the railroad track.

Locomotives--The earliest logging locomotives were powered by steam and used cordwood as fuel. In 1832 the first four-wheeled 4-2-0 wood-burning locomotive in the United States was designed and built by John B. Jervis. (4-2-0 referred to the orientation of the driving wheels.) By 1840 two-thirds of all locomotives in America were of this type. Several years later it was superseded by the 4-4-0, designed by Henry Campbell, which could pull heavier loads at low speeds.

By the 1870s technological advances in other industries provided railroad companies with new and better construction materials. The quality of iron had improved, and steel played a more important role in locomotive and rail construction.

Early locomotives transmitted power from the cylinders to the drivers by means of a connecting rod. These rod locomotives had long wheelbases and were best suited for smooth well-maintained roads with easy grades. Rod locomotives were used for main line grades where the haul exceeded 7-8 miles distance (Bryant 1914:304).

In the late 1870s, however, the invention of the geared locomotive made it possible to penetrate terrain, which had been inaccessible to the standard rod locomotive. By the 1880s several variants of this geared locomotive were being produced and sold to logging firms. In 1888, Ephraim E. Shay, a logger from Michigan, adapted the design to specifically meet the logging industry's needs. The combination of maximum traction force with minimum total weight enabled the engines to traverse steep grades and negotiate tight curves (Bryant 1914:305).

The company that manufactured the first Shay was the Lima Locomotive Works of Lima, Ohio. By the early 1900s the Lima-Shay locomotive was the most popular locomotive in railroad logging. The Shay's popularity inspired a number of variants manufactured by competing companies such as the Climax Manufacturing Company of Corry, Pennsylvania and the Heisler Locomotive Works of Erie, Pennsylvania (White 1982:37, 51).

By the 1920s oil was found to be a cheap, efficient fuel for locomotives, and by the 1930s the transition from the use of wood to oil was almost complete. Advances in logging equipment and locomotive technology continued into the

twentieth century. On the other hand, most small logging operators had continued to use oxen, horses, or small donkey engines for skidding and log transport up to the 1920s and some used steam tractors. In either case, by the close of the Second World War railroad logging companies were converting to the latest technological advancement. Railroad grades were abandoned and roads were constructed for diesel trucks to haul the logs.

Thomas Cox points out that, "...the development of a network of logging railroads was a prerequisite not just for expansion of the lumber industry but for the very survival of its larger components..." (Cox 1974:207). Those "larger components" included entire communities tied to the lumber industry, and local, regional and world lumber markets.

Social/Cultural Environment

The Worker

With the introduction of railroads into the lumber industry, companies needed a more specialized, skilled labor force. As a consequence, a new social structure developed in which those who worked in the woods were separate from those who operated and maintained the railroads. Permanent year-round crews of locomotive engineers, railroad maintenance staff, and managers became part of the division of labor, which had already existed, in the lumber industry. Upward mobility within these groups depended on the size of the labor force, the management structure, and a worker's abilities.

A large proportion of the workforce was of identifiable ethnic groups and nationalities. For example, in El Dorado and Amador counties, logging companies employed Germans, Italians, Swedes, and Chinese. In southern California, Mexicans formed the majority of the labor force in grade construction. Many of these people had already acquired skills in the maintenance and operation of locomotives in their home countries. They found work as engineers, firemen, conductors, and brakemen, while non-skilled individuals worked as laborers in grade and trestle construction, maintenance, and as section hands.

While different ethnic groups may have worked together in the woods, they did not necessarily live together. Many company towns had segregated

housing. In 1922 in the town of Weed, a large number of black laborers were brought in from Louisiana. After white workers protested this "intrusion", the blacks were moved to the periphery of the white housing area. Newspaper accounts and oral histories document many such conflicts between various ethnic groups.

As with other large industrialized labor groups, it became popular to rally for unionization. However, labor organizations never achieved a firm foothold in the California lumber industry as they did in the Pacific Northwest.

Living Quarters

Generally two kinds of living arrangements provided housing for these crews, the larger, more permanent company town and temporary logging camps. The company town centered around a sawmill complex that included a terminal for the main and spur lines, an office, a company-owned store, round house, machinery shops, workers' housing, millpond, and cookhouse. The town of Weed in northern California was an example of this kind of community, as was Caldor in the central Sierra, named after its founding firm, the California Door Company.

A seasonal labor force migrated to the temporary camps in the woods, and returned to their permanent homes in the off-season. Temporary logging camps generally varied from thirty to sixty persons, depending on the size of the operation. Portable skid shacks, and in some cases tents, were used for housing. Because the area being cut usually changed each season, portable camps had to be designed and constructed so that they were easily transported from one site to another. These shacks were taken into the woods on flatbed log trucks pulled by a locomotive. The shacks were easily moved from the log trucks by a donkey engine and placed adjacent to the track close to the logging operation, on flat ground with some form of local water supply. Segregated camps were less common in these temporary woods camps.

Folklore

Words and phrases used to describe a particular occupation or task in the lumber industry developed from the worker's concepts about themselves and their jobs. This unique vocabulary played an important role in perpetuating the folklore of the industry. Many of the words suggested a sarcastic humor prevalent among lumbermen whose lives revolved around the joys and hazards of the job. "Bully" referred to the boss or foremen of the logging camp, while a "turkey" described a bag containing a lumberjack's outfit. "Widowmaker" referred to a broken limb hanging loose in the top of a tree which in its fall might injure or kill a man down below, thus making his spouse a "widow" (USDA 1905; Appendix A). There were hundreds of other terms for various equipment and occupations, which carried a special meaning for generations. As part of the folklore of the lumber industry, the vocabulary can help in understanding its economic and social development.

The development of the railroad logging industry coincided with last stage of America's industrial revolution. The workers, their values and their philosophy, form the social heritage of this industry and of this era.

Conclusions

By the end of the 1930s, the old locomotives and rolling stock were being traded in for an even more efficient method of hauling timber: diesel trucks. By the late 1940s with a rebounding post war economy, more lumber was needed for commercial and residential construction, but railroad logging had become outdated and expensive.

The lumber industry in California, whether with the use of oxen, railroads, trucks, or tractors, has shaped the character of the land, its economy and people. The West would not have developed as rapidly as it did without the railroad systems and the wealth of timber that covers its foothills and mountains. Developments in technology, including steam engines, donkey engines, and Shay locomotives increased lumber production and opened forested areas to supply the developing regional, national, and international markets.

Over one hundred individual railroad-logging systems have been identified on the National Forests of California. The majority of these logging railroads were constructed between 1890 and 1920, and they can be found from the

north along the Oregon border to the south in the San Bernardino Mountains. Several of the earliest logging railroads in California, constructed during the 1860's, are on National Forest lands.

Identification and preservation of important railroad logging sites is a concern of cultural resource managers, railroad historians, and local communities. Locating railroad-logging sites can be complicated by the fact that many railroad grades have been modified to support modern, diesel logging trucks. Alongside these truck routes are signs of earlier railroad grades--piles of ties, old rails, tumbled-down trestles, and railroad spurs snaking their way into the woods. Decaying stumps marked by the logger's springboard and double-bit axe can still be found.

THE RESEARCH DESIGN

The Process

The preceding narrative provides an historical context for understanding the development of the railroad logging industry throughout the state. As outlined in the Region's Management Plan (Attachment 1), contextual histories will also be produced for railroad logging systems on each of the Forests. Each history will develop a chronology of the industry and document railroad systems within a particular area.

A model will then be developed which defines where railroad-logging sites were most likely to have existed within given environmental and economic parameters. The physical environment played a large role in determining where and how railroad logging developed. Where were commercially marketable trees located? How did the physical terrain determine where grades could be constructed? Answers to questions like these will tell where railroad-logging sites are most likely to be found.

Railroad logging was first and foremost an economic venture. Lumber companies strove to maximize profits and railroads could increase their ability to do this. Weber's theory of resource procurement tells us that:

"Sites would be selected as to minimize unnecessary movement; sites represent minimum energy, least-cost locations. The location of the site will therefore, depend on the distance to and from external resources, the weight of the material to be moved, and the effort or competitive cost of all movements . . ." (Clarke 1977:22-23).

We can use Weber's Mini-Max theory to refine our model of the most likely locations of railroad logging sites. Where were the markets and distribution points? How far into remote areas could a system penetrate and maintain economic viability? Answers to these and other questions will give us an economically efficient model.

This model, based on environmental and economic parameters, can then be compared to the geographical location of known railroads. The model tells us where we may assume railroad logging would have occurred, and the site data tells us where, in fact, it did occur. It is not likely that these two will correlate completely, and it is important to look for the inconsistencies. When deviations occur, they probably indicate that some other factor has come into play. It is quite possible to have some socio-political factor causing a company to adopt an "inefficient" system. Competition might force one company into a more remote or less productive area. An ethnically diverse work force might explain a unique arrangement for living quarters in a camp.

All of the factors change through time and innovation. As timber is depleted, the environment is altered, and the logging company relocates. When new technologies come into play, a company's ability to exploit the resource changes, and a new Mini-Max model is established.

The next section will address each of the factors, economics, environment, social/cultural dynamics, and technology, as separate research domains, but it is important to remember that they are closely integrated, and that they can only be understood as they relate to each other.

Research Domains

These domains are designed to be used in conjunction with the Regional Management Plan and the Historical Background portion of this design. The

domains provide a guide for assessing railroad logging systems within broad patterns of state and local history. Properties can be evaluated based on their potential to answer research questions in these four areas. This assessment will lead the development of appropriate management and data recovery strategies. These domains can also guide development of National Register nominations. Criterion A requires discussion of a property's role in its broad historical context.

In developing these research domains, we are especially concerned with questions of how one system compares with others and how they are unique, and with their integration with the larger picture. There were undoubtedly similarities between railway companies and systems, particularly those constructed in like environments. Yet each system will have its own, unique attributes. The study of railroad logging in a broader context will also provide information on the entire forested environment, rural economies, industrialization, technological change, and the modern world economy.

Company records, inventories, photographs, maps, government documents, and oral histories can provide the information needed to explore these topics. Archaeological investigations will provide supportive information, and use of all of these resources will advance our knowledge and foster new questions.

Each domain is described in terms of its rationale, the reasons for addressing them. The research direction and test propositions provide broad guidelines for developing research strategies and illustrate how the domains interrelate.

Economics

Rationale

The study of economics is pivotal in our understanding of each of the other domains. When we have defined the "efficient" system based on the Mini-Max Theory, we can compare that model with data from the archival and archaeological records. This will enable us to identify the influence that socio/cultural dynamics and technologic innovation had on the system.

Research Direction and Test Propositions

Railroad logging can be viewed as a harvest system. Raw materials were extracted from the forest, moved by various methods to the railroad, and then transported to the mill for processing (see Map 4). The amount of timber harvested depended on more than just timber volume and an individual company's management decisions. The quantity varied over time, depending on regional, national, and international market conditions, available technology, and legal parameters imposed by public land policies. Various economic hypotheses can be addressed which test the economic factors influencing this harvest system.

Important test propositions can be based on Weber's theory: did a lumber company determine the location of a railroad logging system based on its desire to maximize profits? Another proposition involves factors influencing input and output. Different firms may have had different production goals, or a single firm may have had changing or even conflicting goals. What factors determined the timber output and the amount of energy input to obtain that output?

The concept of diminishing returns can be tested in terms of railroad logging systems. Diminishing returns is defined as a situation in which one production factor is increasing while others are held constant, resulting in the eventual diminishing of output. A testable hypothesis is that the inputs--workforce, equipment, size of operation--had to be modified to accommodate the point of diminishing returns. The cause for diminishing returns can be found in company records and other archival data. When the cause has been established, other economic factors such as increased or decreased availability of labor, rising costs of production, the introduction of new technology, or social/cultural dynamics can be identified and compared.

Many other testable hypotheses relate to the economics of railroad logging systems. Economics was the principal factor governing the railroad logging industry, and understanding it may lead to answers to research problems in the other research domains of environment, technology, and social/cultural.

Technology

Rationale

Technology can be studied in order to 1) define the prerequisites for technological retention and change, and 2) determine the effects of a particular technology on society and the environment. Railroad logging is the adaptation of railroad technology to the logging industry (see Plates 4-11). But, it is also part of the evolution of technology in a broader sense:

. . . the complex of knowledge, methods and other resources used in making a particular kind of product or in creating a particular procedural system. . . at a given time in a particular society (Hannay and McGinn 1980:27; Appendix A; Brown and Elling 1981:128).

Research Direction and Test Propositions

Various technological responses can be examined, including the evolution and diffusion of technology from more efficient to more productive systems in terms of energy inputs and outputs.

Reconstructing simple, as well as complex technological processes is also important. George A. Teague argues:

Past industrial documentation has focused on high-level "state of the art" technology, at the expense of lower levels. You will be hard pressed to find instructions on how to cobble a winch drum . . . or how to fabricate drainage lines of home cast tiles. It is just this sort of information, which will be of value to people who want to develop industry depending on human labor and cheap resources. This is the kind of information that archaeology can provide (Teague 1980:19).

In 1980 Jim McDonald examined the research potential of railroad logging technology (Appendix C). In another study, the importance of railroad logging studies to the reconstruction of labor intensive versus capital intensive technology was recognized by Brown and Elling in their study of railroad logging on the Sequoia National Forest (Brown and Elling 1981:115-116). The following test propositions are largely taken from their studies.

1. Are certain technologies developed or discovered in response to environmental conditions?
2. Did the adoption of railroad technology by the lumber industry result in short term or long term increases in productivity and efficiency (taking into account such factors as government regulations, market value, accessibility to the resource, etc.)? If not, were there other non-economic reasons (such as union-busting) for the adoption of a particular technology (McDonald 1980)?
3. Did the lumber industry parallel other extractive industries in the shift from labor intensive to capital-intensive technology?
4. How was specific equipment designed, modified and used during the railroad-logging era?
5. What can these designs tell us about how people thought about economic efficiency, business-social responsibility, and acceptable levels of health and environmental risks in industrial society?
6. To what extent were the methods employed on a particular Forest consistent with other Forests in the Region? Were differences attributable to local adaptation (to a particular species or availability of a particular technology), or were they precursors of technological advances?
7. To what extent was the demise of the railroad logging industry due to a lack of developing new technologies within the industry?

Environment

Rationale

Study of the effects of historical railroad logging on the environment is of particular importance to forest managers today. To better manage forestlands, we need to understand the long-term effects of various

harvesting technologies. An historical perspective adds time depth to these studies.

The environment affected railroad logging and railroad logging modified the environment. The physical environment determined where and how railroad logging could be developed. In turn, the contemporary landscape is a by-product of the effects of technology on the environment.

This research domain is closely related to the other. Economic concerns generally preceded environmental concerns, but environmental factors could affect the long-term economic viability of a railroad logging system. Answers to questions of how the environment was affected by this technology employed will give us additional information about the society, which exploited the natural resources of the forests.

Published documents, company records, oral histories, and physical evidence generally suggest that railroad logging firms held little regard for the natural environment, and for the first several decades, railroad logging practices were unregulated, unlike mainline railroads such as the Southern Pacific, and Western Pacific.

Research Direction and Test Propositions

To date most studies have concentrated on economic and technological aspects of railroad logging systems; only a few have examined the effects of railroad logging on the environment. One such study is being conducted on the Goosenest Ranger District of the Klamath National Forest near the border of Oregon and California. In this District characterized by rolling hills, numerous drainages and lakes, vast stands of ponderosa pine were logged in the past. As a result, regeneration was poor and the area is now covered by juniper scrublands. Similar studies can be conducted to determine the effects of railroad logging operations on other environments.

Did railroad-logging firms recognize the long-term effect they were having on the environment? If so, how did they respond to this issue? How did society as a whole perceive the effects of railroad logging on the environment during the early 1900s, and how has that perception changed today with the use of modern technology? Company records, published

documents, and oral histories will be important sources in answering these questions.

In the archaeological record, the effects of railroad logging on the environment may provide information on the overall development of the railroad logging industry and on railroad logging technology. The physical remains of railroad logging systems on National Forests provide evidence of the effects of technology on the natural resources during the nineteenth and early twentieth centuries. This evidence may be examined to determine how technology affected natural resources, and how this effect differed from one railroad system and one environment to another.

Social/Cultural

Rationale

The study of railroad logging can add to our knowledge of important cultural and sociological questions, many of which are closely related to the other research domains. How did people perceive, use, and adapt to their environment? How did they react to economic change and stress?

Research Direction and Test Propositions

Primary and secondary source documents indicate that thousands of people of various nationalities worked in the railroad logging industry. As with other studies of industrialization and social change, the archival record does not always provide adequate information on a particular society. From company records we know what foodstuffs were purchased, how they were prepared, and how they were served. But we do not know, for instance, whether certain nationalities ate separately. To what degree did assimilation occur? Information concerning ethnicity, assimilation, and daily living habits may be found in the archaeological record.

How can the study of railroad logging contribute to our understanding of the society that produced it? What can we learn about human behavior from railroad logging camps? Jim McDonald's programmatic evaluation of the research potential of railroad logging technology outlines some of these questions (Appendix C) as does Brown and Elling's (1981) overview of

redwood logging on the Sequoia National Forest. However, there have been few attempts to define the anthropological and historical values of railroad logging sites.

In a study of railroad logging societies, groups might be defined by the type work they performed or by ethnic and national origin. The study of these groups may yield demographic information and broaden our knowledge of inter- and intra-community relationships.

Strong ethnic traditions were maintained in logging camps, and this was sometimes reflected in job status. But ethnic groups are difficult to identify because of the transient living conditions and the fact that workers often identified with several communities and work environments.

If the goal of a company was to assimilate its workers into the social order of the logging communities, then this assimilation, or the lack of it, may be evident in the archaeological, archival, and oral records. Archaeological evidence alone should not be used to make definitive judgments about ethnicity. There are many factors that could prejudice field survey or excavation data. Therefore, the first task is to identify the nationalities within the labor force of each company, using archival and oral information. The second task is to develop specific research questions from that information.

The following are some examples of research questions:

1. What was the size of the labor force and what nationalities worked within that labor force?
2. What specific tasks were performed by different nationalities?
3. What type of law enforcement was carried out in logging camps and company towns? Was it equitable between ethnic groups?
4. Did the Industrial Workers of the World (I.W.W.) have an effect upon the labor force within the company?

5. How did the recessions (1890s, 1910s) and the Great Depression affect the social/cultural makeup of the labor force?
6. How mobile were the workers within a company?
7. Did management ignore public environmental issues such as over cutting and stream siltation?

FOOTNOTES

1. Gold Rush journals, memoirs, etc., attest to the rapid depletion of yellow pine forests surrounding the mining camps of the Mother Lode region of California. Emigrant diaries written enroute to the mines describe the virgin stands of timber along the way.

2. Federal land grants to railroads totaled 11,585,534.28 acres of California land. The Central Pacific received the largest grant.

3. Ward McAfee, *California's Railroad Era 1850-1911*. Golden West Books, San Marino, CA. 1973. p. 51. The Central (Southern) Pacific filed a map of its proposed route with the Department of Interior on January 3, 1867, however, it was not until three years later that they received Congressional authority to proceed along the route.

4. Several of the Short Line Railroads operating in California included:

California Western Railroad--Fort Bragg to Willits (ca. 40 miles), connected with the Northwestern Pacific Railroad at Willits for carrying outbound lumber, forest products, and passengers. On February 14, 1973, the Georgia Pacific Corporation acquired control of this railroad.

McCloud River Railroad Co.--Mt. Shasta to Burney (77.9 miles), connected with the Southern Pacific, Burlington Northern, and Western Pacific Railroads for carrying outbound lumber and forest products. Owned by Champion International.

Quincy Railroad Co.--Quincy to Bell Lane, Ca. (3.27 miles) For carrying outbound lumber and forest products. Organized July 1909 and owned by Di Giorgio Lumber Co. (Source: Edward A. Lewis. *American Short Line Railroad Guide*. The Baggage Car, Strassburg, Pa., 1975).

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ILLUSTRATIONS

LIST OF ILLUSTRATIONS

1. An abandoned spur of the Madera Sugar Pine Lumber Company's logging railroad, showing laminated bridge stringers made of 2 x 10 common planks. The ties have been removed. The picture shows how this type of bridge stringer could be curved to accommodate the curvature of the track. Photo by E. Fritz, May 1925. Sierra National Forest.
2. Frame trestle on a logging spur of the Diamond Match Company's logging railroad. Length 540 ft., height 60 ft. Photo taken near Stirling, Butte County, CA. n.d. Lassen National Forest.
3. Type of small bridge used on logging spurs. Inexpensive but serviceable construction--they did not bother to bark the timbers. n.d.
4. Loaded logging train of the Madera Sugar Pine Company. n.d. Sierra National Forest.
5. A stream donkey loading logs onto railroad cars. n.d. Lassen National Forest.
6. The McCloud River Lumber Company temporary camp near Mt. Shasta, CA. n.d. Shasta-Trinity National Forest.
7. The kitchen and dining rooms were made portable so they could be moved on flat cars and quickly set up at a new camp. McCloud River Lumber Company temporary camp near Mt. Shasta, CA. n.d. Shasta-Trinity National Forest.
8. A clean camp street, with tents on the left and portable skid shacks on the right. McCloud River Lumber Company temporary camp near Mt. Shasta, CA. n.d. Shasta-Trinity National Forest.
9. The sawmill of the Michigan-California Lumber Company showing haulups for the two bands. When this picture was taken the mill was about 30 years old. Photo by E. Fritz, May 1925. Eldorado National Forest.

10. Bunk houses at Danaher Mill, Pino Grange, CA. n.d. Eldorado National Forest.

11. Area logged by 2-speed donkey engine using high lead. Operated by the Diamond Match Company near Stirling City, CA. n.d. Lassen National Forest.

12. Logged area had been accessed by logging railroad. Hammond Lumber Company. 1916 or 1917.

13. Old cutting, Marsh Lumber Company. n.d. Plumas National Forest.

APPENDICES

APPENDIX A

Glossary and Site Definitions

Note: Capitalized entries indicate site types, features, or other archaeological categories. The types are functional in character and for the most part follow traditional classes. Refer to Brown and Elling (1980) and Elling (1982) for other categories.

Ax -Felling ax with a double bit weighing 3-1/2 to 4-1/2 lbs (Berry 1917:14).

Ax, swamping - Double bit ax about 1/2 lb heavier than a felling ax (Berry 1917:14).

Battery - Two or more donkey engines for dragging logs, set at intervals on a skid road (USDA 1905:30).

Big wheels - See logging wheels (USDA 1905:30).

Big Wheel (yarding) - Stiff-tongue or Michigan logging wheel. These have 10 ft-diameter wheels, 6-ft tread, and 6-in tires. The axle is wooden, and the tongue is a 6-ft pole fastened rigidly to the axle. Some big wheels were manufactured locally in California. These had 12-ft wheels and arched iron axles (Berry 1917:20).

Slip-tongue big wheels were designed for steep ground and long hauls. They had 10-ft wheels, 6-in tires, 6 1/2-ft tread, and 30-ft tongues. These big wheels could be used where slopes were up to 15 percent (Berry 1917:22).

Boom rat - Someone who works on a boom (USDA 1905:31).

Briar - A crosscut saw (USDA 1905:31).

Buck -

1) To saw felled trees into logs.

2) To bring or carry, as to buck water or wood (USDA 1905:31).

Bucker -

- 1) Someone who saws felled trees into logs. Syn: cross cutter.
- 2) Someone who brings or carries. See buck (USDA 1905:31).

Bull cook - See chore boy (USDA 1905:31).

Bull donkey - A large donkey engine, which used a drum and cable to drag, logs from the place where they were yarded to a landing (USDA 1905:32).

Bully (Bull Buck) - A common name for the foreman or boss of a logging camp (USDA 1905:32; Hawksworth 1979:23).

Bummer - A small truck with two low wheels and a long pole, used in skidding logs. Syn: drag cart, skidder (USDA 1905:32).

Bunk hook - The hook attached to the end of the bunk on a logging car, which may be raised to hold the logs in place or lowered to release them (USDA 1905:32).

Butt team - In a logging team of four or more, the pair nearest the load (USDA 1905:32).

CAMP - The occupation site of the logging crew. Historical occupational debris, standing structures, privies, or other features characterize these sites. See below:

PERMANENT CAMP - Most permanent camps in railroad logging were located at or near the sawmill. See mill camp (Berry 1917:8).

TEMPORARY CAMP -

Type 1 - Logging camps - these camps were used for one or more seasons and were located as near as possible to the logging site and the tracks. At first these camps were built in-place, and torn down or abandoned with every move. These camps consisted of large bunkhouses, with double tiers of bunks inside. Portable units that could be transported by railroad flatbed later replaced them. One source describes these structures as 10 by 18-ft or 9 by 22-ft frame cabins for sleeping. The 10 by 18-ft type was

transported on standard gauge operations and the 9 by 22-ft on narrow gauge operations. The cabin sides were usually 7 or 7 1/2-ft tall with battened walls. The half-pitched roofs were double-boarded or covered with tarpaper. Two skid timbers about 8 by 10-ft were placed lengthwise under each cabin to serve as a foundation. Each cabin held four men. They had single bunks or preferably steel cots. They also have a tale[?] and stove. Dining cars and bunk cars were also used. Most camps had a small commissary for the men to buy tobacco, etc. (Berry 1917:8-9).

Type 2 - Camps located away from the railroad used for construction and logging. They often used tents for stables and dining rooms. Others of this type used for railroad maintenance and construction, and flume tender stations (Berry 1917:9).

Camp inspector - A lazy lumberjack who goes from one logging camp to another, working only a short time in each (USDA 1905:32).

Cant dog - See cant hook (USDA 1905:32).

Cant hook - A tool like a peavey, but having a toe ring and lip at the end instead of a pike. See Peavey. Syn: cant dog (USDA 1905:32).

Choke - A noose of wire rope by which a log is dragged (USDA 1905:32).

Choker man - The member of a yarding crew who fastens the choker on the logs (USDA 1905:33).

Chopper - See Faller (USDA 1905:33).

Chore boy - Someone who cleans up the sleeping quarters and stables, cuts firewood, builds fires, and carries water. Syn: bull cook, flunkey, shanty boss (USDA 1905:33)

CHUTE - A V-shaped trough built of poles for log transportation located below the area to be logged. Often constructed of shaped logs with the butt-end down slope. Associated artifacts and features include spikes, grease strips, grease cans, and trail roads. A variant of the "chute" was the cross-log chute. Logs were laid parallel to each other and a slight depression

cut in the center of each. A team of oxen pulled the log with chains along the chute. See slide. (USDA 1905:33).

HORSE CHUTE - Poles used were cut 50 or 60 ft long, about 8 or 9 in diameter at the small end, and as large as 16 in at the butt end. These were laid in parallel rows about 5 in apart. The ends were notched and joined. The inner surfaces were then leveled off to make the width at the top 16 in and 8 in at the bottom. A rough road was cut alongside the chute for the team of horses. A 5% was the minimum desirable grade. A steeper required less chute grease and horsepower. Bridges were constructed where trestles were used in donkey chutes. An even descent must be maintained. Horse chutes are usually built on side hills or along creek bottoms. (Orr 1919).

DONKEY CHUTE - This type of chute was constructed for moving logs with a steam donkey. They consisted of two parallel series of poles laid end to end. The ends were jointed together with the top toward the direction the logs were to be hauled. The poles were 6 or 8 in apart and the inner sides are leveled off to form a roughly 10-in width at the bottom and 3 -in width at the top. Cross skids were placed at 10-in intervals to support the chute poles. Some firms used three pole chutes with the third pole imbedded in the ground between the other two. The average diameter of the outside pole was from 14-18 in; the width at the top of the hewing was 30 in and at the bottom 18 in; the depth was 8 in (Berry 1917:36-37).

Type 1 - Ridge or cross-country chutes - these chutes are usually located on the crest of a ridge that has an even grade. If a ridge is lacking these chutes are built using ridges and benches as much as possible. They are built to pass through the most heavily timbered areas (Orr 1919).

Type 2 - Side hill chutes - these were constructed where ridges on slopes are long and steep or where creek bottoms were crooked or rocky. They were located well above the creek bottom on a long, steep slope. These were less expensive to build and operate than creek bottom chutes (Orr 1919).

Type 3 - Canyon or creek bottom chutes - by 1918 this type of chute was becoming less preferred. They needed constant repair. Because they were located at the stream bottom, the chute soon rotted and spring freshets often washed them out. In late fall, frost damaged the chutes because of rolling out or tearing up. If the stream or creek was crooked curves had to be negotiated with expensive trestling. (Orr 1919).

Chute crews - Work crews that operated the steam donkey chutes usually including a donkey engineer, a donkey foremen, a wood cutter for donkey fuel, a chute greaser who greased the chute and oiled the block and spools, a head chaser, and an assistant chaser. The chasers made up the trail grade and rode to the mill with the logs (Berry 1917:3; Orr 1919).

Chute frogs - Junction of two or more chutes. This was the outer end of a chute, which guided the logs into the chute. Shear logs of 30 to 36 in diameter were placed outside the frog to reinforce it. These shear logs were V-shaped with the broad part of the V toward the bull block post. The frog was where the wear and tear took place on a chute (Orr 1919).

Chute requirements - Trestles for crossing ravines and creeks, grading or cribbing along the side of a steep slope, cuts through sharp rises in the ground or a narrow steep ridges, and foundations crossing low swale or boggy areas (Orr 1919).

Hewing chute logs - The final stage of chute construction. This smoothed the interior of a chute so that logs could pass down it easily (Orr 1919).

Chute spool posts - Needed on curves where the main line had to be kept close to the chute. These vertical logs, usually 20 to 30 in diameter and 5 to 77 in high, were braced with poles and cable (Orr 1919).

Tools for constructing saws, wedges, sledges, and hammers were used for chutes felling trees. Grading required shovels, picks, drills, crowbars, and powder. Chute poles, peavies, cant hooks and crowbars were used to place the chute, and broad axes were used to hew the poles. A Dolbeer donkey or horses transported the chute poles and timber. A Dolbeer steam donkey was more efficient, and less expensive than horses. The work went quicker because larger and longer poles could be used, heavier timbers for trestles and cribbing could be used, and poles could be brought in from greater distances (Orr 1919).

Commissary - A general store providing supplies for the lumbermen (USDA 1905:33).

COOK CAMP - The building used as kitchen and dining room in a logging camp. Syn: cook house, cook shanty (USDA 1905:33).

Cooke - Assistant cook and dishwasher in a logging camp (USDA 1905:33).

COOK HOUSE - See Cook Camp (USDA 1905:33).

COOK SHANTY - See Cook Camp (USDA 1905:33).

Corkscrew - A geared logging locomotive (USDA 1905:33).

Corner man - In building a camp or barn of logs, the person who notches the logs so that they fit closely and make a square corner (USDA 1905:34).

CRIBBING - Often used rather than trestles or fills for constructing temporary grades. Consisted of large logs laid at right angles to the track, 12 ft apart. Two logs, laid lengthwise on top of these, were called stringers.

Cross cutter - See Bucker (USDA 1905:34).

Deacon seat - The bench in front of the sleeping bunks in a logging camp (USDA 1905:34).

Deadman - A sunken weight or a log used to anchor a cable (Woodwards 1977:46).

Decker - Someone who rolled logs on a skid way or log deck (USDA 1905:35).

Dingle - The roofed-over space between the kitchen and the sleeping quarters in a logging camp commonly used as a storeroom (USDA 1905:35).

Dog - short, heavy piece of steel bent and pointed at one end with an eye or ring at the other. Used for many purposes in logging, and sometimes shaped so that a blow directly against the line of draft would loosen it (USDA 1905:35).

Dogger - One who attaches the dogs or hooks to a log before it is steam skidded (USDA 1905:35).

Donkey - A portable steam engine, equipped with drum and cable, used in steam logging. See Road donkey; Yarding donkey; Bull donkey; Spool donkey (USDA 1905:35).

Donkeys were classified according to the size of their cylinders. The original donkey was the Dolbeer or spool type and used mainly for chute and trestle construction. Its standard size was 6 by 12 in cylinder. The boiler was 36 by 6 in and carried 160 pounds of steam. Later machines ranged from 48 in diameter and 118 in high to 72 in diameter and 144 in high and carried 175 to 200 pounds (Berry 1917:24). By 1917 the Dolbeer it was labor intensive and its yarding distances too short (Berry 1917:31).

Donkey sled - The heavy sled-like frame, which a donkey engine is fastened to (USDA 1905:35).

Dray - A single sled used in dragging logs with one end of the log resting on the sled (USDA 1905:36).

DRAY ROAD - A narrow road cut just wide enough to allow the passage of a team and dray (USDA 1905:36).

Dudler - An engine for used hauling logs, which propelled itself, dragging its load by a large, revolving spool around which several turns of a cable were fixed at each end of the track. Syn: Dudley (USDA 1905:36).

Duffle - The personal belongings of a woodsman or lumberjack, which he took into the woods (USDA 1905:36).

Engines

Type 1 -Geared engines - used to negotiate heavy grades and sharp curves. The maximum grades were they could take 5 percent empty and 2 percent loaded. The maximum curves were 25-30 degrees for standard gauge track and 30-40 degrees for narrow gauge (Berry 1917:48).

Type 2 - Rod engines - maximum grades were 3-4 percent empty and 1 percent loaded. The sharpest curves were 16 degrees for standard gauge track and 20 degrees for narrow gauge (Berry 1917:48,56).

Faller - One who felled trees. See Head faller; Second faller. Syn: sawyer, chopper (USDA 1905:37).

Falling ax - An ax with a long helve and a long, narrow bit, designed for felling trees (USDA 1905:37).

Falling wedge - A wedge used fall a tree in the desired direction, by driving it into the saw kerf (USDA 1905:37).

Feeder - Barn boss (USDA 1905:37).

Filer - One who files the crosscut saws in the woods. Syn: saw fitter (USDA 1905:37).

Fitter - One who notches the trees for felling and afterwards marks the log lengths into which it is to be cut (USDA 1905:37).

FLUME - A wooden water trough on trestles or cribwork FOR carrying logs to milling or lumber to loading points. They were constructed of beams or poles, planking, and spikes. They consisted of a V-shaped box, 32 in wide in mountainous areas and 48 in wide where the grade was lower. The sides were up right and, the width across the top was 46 in when the sides were 32 in wide. Every 8 or 16 ft the flume was supported by bents. The bents were 4-6 in fir timbers (Berry 1917:89-90). This type of construction cost 60 to 75 percent less than building railroads [Ed. note, Berry:1917].

FLUME OR CHUTE STATION - A station where a tender or chaser maintained the flume or chute. A structure, domestic trash, and various tools characterize these sites.

Flume clamp - Piece of iron shaped like a large staple, which held both ends of a stack of boards together as they floated down a flume.

Flunkey -

1) An assistant, usually to the engineer of a donkey engine or to the cook in a logging camp.

2) See Chore boy (USDA 1905:37).

Frog -

1) The junction of two branches of a flume.

2) A timber placed at the mouth of a slide to direct the discharge of logs.

(Gen.) Syn: throw out. See Chute frog (USDA 1905:37). Apparatus to rerail rolling stock.

Go-back road - A road on which unloaded logging sleds returned to the skidways for reloading to avoid meeting loaded sleds enroute to the landing (USDA 1905:38).

Go-devil - See Dray (USDA 1905:38).

Grab skipper - A short iron pry or hammer used to remove the skidding tongs from a log (USDA 1905:38).

GRADE - A completed base for railroad. It can be associated with the following artifacts: spikes, fishplates, ties, and slag.

Grapples - Two small iron dogs joined by a short chain used to couple logs end to end when skidding on slopes. Syn: chain grapples, coupling grab.

Gravel a dam - To cover the upstream side of the timberwork of a dam with gravel or earth to make watertight (USDA 1905:38).

Greaser - See Road monkey (USDA 1905:38). Syn: Grease monkey.

Grips - See Skidding tongs (USDA 1905:38).

Gun - To aim a tree in felling it. In the case of very large, brittle trees such as redwood, a sighting device (gunning stick) was used. Syn: point, swing (USDA 1905:39).

Gunning stick - See Gun (USDA 1905:39).

Gutterman - See Swamper (USDA 1905:39).

GUTTER ROAD - The path followed to skid logs. Syn: drag road, runway, skidding trail, snaking trail (USDA 1905:39).

Hang the boom - To put the boom in place (USDA 1905:39).

Haul - In logging, the distance and route over which teams must go between two given points, as between the yard or skidway and the landing (USDA 1905:39).

Haul back - A small wire rope, traveling between the donkey engine and a pulley set near the logs that were to be dragged, used to return the cable. Syn: back line; pull back; trip line (USDA 1905:39).

Haul up - A light chain and hook by which a horse could be hitched to a cable and moved where desired (USDA 1905:39).

HAY ROAD - See Tote road (USDA 1905:39).

Haywire outfit - A contemptuous term for loggers with poor logging equipment (USDA 1905:39).

Head faller - The chief of a crew of fallers (USDA 1905:39).

Head push - See Straw boss (USDA 1905:39).

HEADQUARTERS - The distributing point for supplies, equipment, and mail, not usually the executive or administrative center (USDA 1905:39).

HEAD TREE - In steam skidding, a tree with a cable which runs were attached to (USDA 1905:39).

Helper - Second faller (USDA 1905:40).

Inclines - Inclined tracks for lowering or hoisting logs. Commonly these were used to lower logs to the main line from grade further up the mountain. Many times the upper half of the track was double and the lower was single. A loaded car was lowered at the same time that an empty one was hoisted.

A large donkey was sometimes used to lower and lift the cars. (Berry 1917:62-63).

Jackpot - A contemptuous expression applied to an unskillful piece of work in logging (USDA 1905:40).

JAMMER -

- 1) An important type of gin, mounted on a moveable framework, and used to load logs on sleds and cars by horsepower (USDA 1905:40).
- 2) Steam donkey engineer.

Jiboo - To remove a dog from a log (USDA 1905:40).

Jumper - A sled shod with wood, used for hauling supplies over bare ground into a logging camp (USDA 1905:40).

Katydid - See Logging wheels (USDA 1905:40).

LANDING -

- 1) A place to which logs are hauled or skidded preparatory to being transported by water or rail. A rough and tumble landing is one in which no attempt is made to pile the logs regularly. Syn: bank, banking ground, log dump, rollway, yard.
- 2) A platform, usually at the foot of a skid road, where logs are collected and loaded on cars. A lightning landing was had an incline used to roll logs directly onto the cars without assistance (USDA).

Cable or chain, chokers, and grades may also be present.

Landing man - Someone who unloads logging sleds at the landing and arranges logs (USDA 1905:41).

Lead - A snatch block with a hook or loop for fastening it to convenient stationary objects, used for guiding the cable by which logs are dragged (USDA 1905:41).

Lead line - A wire rope, with an eye at each end, used to anchor the snatch block in setting a lead (USDA 1905:41).

Limber - One who cuts the limbs from felled trees (USDA 1905:41). Syn: knotter.

Lizard - See Dray (USDA 1905:41).

Loader -

- 1) One who loads logs on sleds or cars.
- 2) See steam loader (USDA 1905:41).

Loading chain - A long chain used in load or pile logs with horses. Decking chain (USDA 1905:41).

Logging - Handling logs from cutting standing timber to processing in the sawmill (Berry 1917:13).

Log cars - 3 types of railroad cars - separate trucks, skeleton cars, or connected truck and flats.

Separate truck - These were used for hauling long logs on crooked roads, usually on narrow gauge roads. They were expensive and the danger of accidents was great. They had hand brakes.

Skeleton - Flat bed cars, known as trucks, which were best used for short logs.

Flats - Used on narrow gauge, these cars were 24 ft long by 7 1/2 or 8 ft wide. On standard gauge rails the two types were common 26 and 41 ft long. These were best suited for short length couplers and were of ten pin or automatic. In 1917 air brakes and automatic couplers were replacing the pin couplers and older style brakes (Berry 1917:58).

Logger - One engaged in logging (USDA 1905:42).

Logging sled - The heavy, double sled used to haul logs from the skidway or yard to the landing (N.F.).

LOGGING-SLED ROAD - A road leading from the skidway to the landing (USDA 1905:42).

Logging wheels - A pair of wheels, usually about 10 ft in diameter, used for transporting logs. Syn: big wheels, katydid, timber wheels (USDA 1905:42).

Lug hooks - A pair of tongs attached to the middle of a short bar, used by two men to carry small logs (USDA 1905:42).

Lumber - To log or to manufacture logs into lumber, or both (USDA 1905:42).

Lumberjack - Someone who works in a logging camp (USDA 1905:42).

Lumberman - Someone engaged in lumbering (USDA 1905:42).

Marking hammer - A hammer with a raised emblem, which is stamped on logs to indicate ownership (USDA 1905:42). Syn: Marking iron.

Marking iron - See Marking hammer (USDA 1905:42).

MILLS -

Type 1 - Mill camps - Consisted of a mill, housing units, cooking facilities, a common dining room, storage facilities, log and lumber storage areas, outhouses and often blacksmith shops. The cabins were larger than those used in the logging camps although they are of similar construction. There were a few cottages for families. These mills were occupied and operated seasonally.

Type 2 - Mill towns included a mill, management offices, housing for single men, married families, managers, a store, a post office, loading and unloading facilities, storage facilities, drying yards, cookhouse and dining hall, and shops for repair of equipment. In most cases, they also had water systems.

A Tennant version of this type of town had not mill, but had the other elements of a mill town. See sawmill towns, which also come under Type 2.

MILL POND - The pond near a sawmill in which logs were held prior to being sawed into lumber (USDA 1905:42).

Mill saws - Circle - small and large (Berry 1917:68-69).

Band - single and double (Berry 1917:71-80).

Peaker -

1) A load of logs narrowing sharply toward the top and shaped like an inverted V.

2) The top log of a load (USDA 1905:43).

Peavey - A stout lever 5 to 7 ft long, fitted at the larger end with a metal socket and pike, and a curved steel hook which worked on a bolt; used in handling logs, especially in driving. A peavey differs from a cant hook in that it has a pike instead of a toe ring and lip at its end (USDA 1905:43).

Peeling of logs - To peel the bark off logs before skidding. This is done only in horse logging (Berry 1917:17).

Pull the briar - To use a crosscut saw (USDA 1905:44).

Rigging - The cables, blocks, and hooks used in skidding logs (USDA 1905:44).

Rigging slinger -

1) A member of a yarding crew, whose chief duty was to place chokers or grabs on logs.

2) Someone who attached the rigging to trees in steam skidding (USDA 1905:44).

Road donkey - A donkey engine mounted on a heavy sled, which dragged logs along a skid road by winding a cable on a drum. It had a second drum for the haul-back (USDA 1905:44).

Road gang - The part of a logging crew that cut out logging roads and kept them repaired (USDA 1905:44).

Road monkey - Someone who kept a logging road in good condition (USDA 1905:45).

Roaders - Large donkey engines used to haul the logs down the chute (Orr 1919).

Rutter - A plow used for cutting ruts in a logging road for the sleds to run in (USDA 1905:45).

Saddle - A transverse depression cut in a skid road to guide the logs which pass over it (USDA 1905:45).

Sampson - An appliance for loosening or starting logs by horsepower. It usually consisted of a strong, heavy timber and a chain terminating in a heavy swamp hook. The timber was placed upright beside the log to be moved, the chain was fastened round it, and the hook inserted down low on the opposite side. Leverage was applied by a team hitched to the upper end of the upright timber (USDA 1905:45).

Saws - Falling - the common length was 8 ft, but sometimes a 10 ft saw was necessary (Berry 1917:13).

Saw fitter - See Filer (USDA 1905:45).

SAWMILL TOWNS - Towns with large boarding houses for single men and cottages for married employees. They also had a mess house, sewer, and water systems (Berry 1917:10). See Mill town, Type 2.

Sawyer - See Faller (USDA 1905:46).

Second faller - The subordinate in a crew of fallers (USDA 1905:46).

Send-up man - The member of a loading crew who guided logs up the skids. Syn: ground loader (USDA 1905:46).

Setting - The temporary station of a portable sawmill, a yarding engine, or other machine used in logging (USDA 1905:46).

Shanty boss - See Chore boy (USDA 1905:46).

Signal man - Someone who transmitted orders from the foreman of a yarding crew to the engineer of the yarding donkey (USDA 1905:46).

Skid -

- 1) To draw logs from the stump to the skidway landing or mill. Syn: snake, twitch
- 2) As applied to a road, to reinforce by placing logs or poles across it (USDA 1905:46).
- 3) A log or pole, commonly used in pairs, on which logs were handled or piled (Gen.); or the log or pole laid transversely on a skid road (USDA 1905:46).

Skidder -

- 1) One who skids logs.
- 2) A steam engine, usually operated from a railroad track, which skids logs by means of a cable. Syn: steam skidder.
- 3) The foreman of a crew which constructs skid roads.
- 4) See Bummer (USDA 1905:47).

Skidding chain - A heavy chain used in skidding logs (USDA 1905:47).

Skidding hooks - See skidding tongs (USDA 1905:47).

Skidding sled - See Dray (USDA 1905:47).

Skidding tongs - A pair of hooks attached by links to a ring and used for skidding logs. Syn: grips, grapples, grabs, skidding hooks (USDA 1905:47).

Skidding trail - See Gutter road (USDA 1905:47).

Skid grease - A heavy oil, applied to skids to lessen the friction of logs dragged over them (USDA 1905:47).

SKID WAYS/ROADS/TRAILS -

- 1) A road or trail leading from the stump to the skid way or landing. Syn: travois road.
- 2) A road over which logs were dragged, having heavy transverse skids partially sunk in the ground, usually at 5-ft intervals (USDA 1905:47).

Sky hooker - See Top loader (USDA 1905:47).

Sled tender -

- 1) Someone who assisted in loading and unloading logs or skidding with dray.
Chain tender
- 2) A member of the hauling crew who accompanied the turn of logs to the landing, unhooked the grabs, and saw that they are returned to the yarding engine (USDA 1905:47).

SLIDE - A trough built of logs or timber used to transport logs down a slope.
Syn: chute, dry slide, slip (USDA 1905:47).

Slide tender - One who keeps a slide in repair (USDA 1905:47).

Sloop - See Dray (USDA 1905:48).

Loop logs - To haul logs down steep slopes on a dray or sloop equipped with a tongue (USDA 1905:48).

Slough pig - Usually a second-rate river driver who is assigned to picking logs out of sloughs in advance of the rear (USDA 1905:48).

SLUICE -

- 1) See Flume.
- 2) To float logs through the sluiceway of a splash dam.

Sluice gate - The gate closing a sluiceway in a splash dam (USDA 1905:48).

Sluiceway - The opening in a splash dam through which logs pass (USDA 1905:48).

Snake - See Skid (USDA 1905:48).

Snaking trail - See Gutter road (USDA 1905:48).

Snatch team - See Tow team (USDA 1905:48).

Spikes - A nail-like fastener used in railroad construction, usually 5 1/2 by 9/16 in (Berry 1917:55).

Split roof - A roof of a logging camp or barn made by laying strips split from straight-grained timber. The strips run from the ridge pole to the eaves, and break the joints with other strips, as in a shingle roof (USDA 1905:49).

Spool tender - Someone who guides the cable on a spool donkey (USDA 1905:49).

Springboard - A short board, shod at one end with an iron calk, which is inserted in a notch cut in a tree. A faller stands on the board while felling a tree (USDA 1905:49).

Spring pole -

1) A pole attached to the tongue of a logging sled and passing over the roll and under the beam, for holding the weight of the tongue off the horses' necks.

2) A device for steadying a crosscut saw, so that one man can use it instead of two (USDA 1905:49).

Spud - A tool for removing bark (USDA 1905:49).

Stag - To cut off trousers at the knee, or boots at the ankle (USDA 1905:49).

Steam hauler - A geared locomotive used to haul loaded logging sleds over an ice road. It was equipped with a spiked metal belt which ran over sprocket wheels replacing the driving wheels, and was guided by a sled, turned by a steering wheel, which the front end rested on (USDA 1905:49).

Steam jammer - See Steam loader (USDA 1905:49).

Steam loader - A machine operated by steam and used for loading logs on cars. Syn: loader, steam jammer (USDA 1905:49).

Steam skidder - See Skidder (USDA 1905:49).

Straw boss - A sub foreman in a logging camp. Syn: head push (USDA 1905:50).

Stumps - The butt end of a tree after it has been fallen. Pine was cut down to 15 in and fir to 16 in diameter. The stumps are 24-28 in high (Berry 1917:11).

Swamper - Someone who swamps. Syn: beaver. gutterman (USDA 1905:50).

Swamp hook - A large, single hook on the end of a chain, used in handling logs, most commonly in skidding (USDA 1905:50).

Sway bar -

- 1) A strong bar or pole, two of which couple and hold in position the front and rear of a logging sled.
- 2) The bar used to couple two logging cars (USDA 1905:50).

Swing - See Gun (USDA 1905:50).

Swing dingle - A single sled with wood-shod runners and a tongue with lateral play, used in hauling logs down steep slopes on bare ground (USDA 1905:50).

Swing team - In a logging team of six, the pair between the leaders and the butt team (USDA 1905:50).

Tail hold -

- 1) A means increasing power in moving a log by tackle. A cable was passed through a block attached to the log and the end fastened to a stationary object. Hauling on the other end produced twice the power of a cable attached directly to the log.
- 2) The attachment of the rear end of a donkey-sled, usually to a tree or stump (USDA 1905:50).

Ties - Standard gauge (Gen.) - 7 in by 8 in (some used 6 in by 8 in by 8 ft). Narrow gauge was 6 in by 8 in by 6 ft (sometimes 6 in by 8 in by 5 1/3 ft) (Berry 1917:53).

Toe ring - The heavy ring or ferrule on the end of a cant hook. It had a lip on the lower edge to prevent slipping when a log was grasped (USDA 1905:51).

Toggle chain - A short chain with a ring at one end, and a toggle hook and ring at the other, fastened to the sway bar or bunk of a logging sled and used to regulate the length of a binding chain. Syn: bunk chain (USDA 1905:51).

Toggle hook - A grab hook with a long shank, used on a taggle chain (USDA 1905:51).

Tonging - Handling logs with skidding tongs (USDA 1905:51).

Top loader - The member of a loading crew who stood on the top of a load and placed logs as they are sent up. Syn: sky hooker (USDA 1905:51).

Tote - To haul supplies to a logging camp (USDA 1905:51).

TOTE ROAD/HAY ROAD - A road used for hauling supplies to a logging camp (USDA 1905:51).

Tote sled - See Jumper.

Tow team/Snatch team - An extra team stationed at an incline in a logging road to assist the regular teams in ascending with loaded sleds (USDA 1905:51)).

TRACK - Narrow gauge, which was 36 in wide when measured from rail to rail (Berry 1917:47).

Standard gauge was 56 1/2 in wide (Berry 1917:47).

Traction engine - Usually 110 horsepower road engine. It was fueled with either wood or oil. The boiler was vertical so that the engine could be used on heavy grades. Seventeen tons was an average weight. The drive wheels were 9 ft 7 in high and 26 in wide. The gas powered caterpillar type engine was used where the ground was soft. This was a 75 horsepower tractor.

TRAM/TRAMWAY - A light or temporary railroad for the transportation of logs, often with wooden rails or poles and operated by horsepower (USDA 1905:51). Characteristics include an overhead cable system of log carrying either run mechanically or by gravity.

TRESTLES - A frame or beam structure used to span a draw. Associated artifacts include bolts, beams, spikes, ties, and earth cut and fill.

Type 1 - Pole timber was usually used on spurs or lines, which were to be used for a short time. This was less expensive than sawed timber, and could be made to last longer by peeling the logs. Usually the bents were 15 ft apart from center to center. Each bent had a log sill and four smaller logs for posts. Rough timber was used for caps and stringers, but bracing was done with 3 in by 8 ft planks (Berry 1917:52).

Type 2 - Sawed timber trestles had bents 15 by 16 ft apart. Each bent rested on a sill which was either sawed lumber or a cedar log. Four 10 by 10 in posts were used in each bent. The two outside had a batter of 2 or 3 in per foot. Each bent had a 10 by 12 in cap 12 ft long. Three 6 by 16 in stringers were placed under each rail to support the ties. The bents were braced with 2 by 8 in or 3 by 8 in sway and collar braces. Narrow gauge trestles had shorter sill and some braces may have been lighter (Berry 1917:52).

Tril hook - See Dog (USDA 1905:50).

Trough roof - A roof on a logging camp or barn, made of small logs split lengthwise, hollowed into troughs and laid from ridge pole to eaves. The joints of the lower tier were covered by inverted troughs (USDA 1905:52).

Trucks - For traction engines were of two types. One was four wheeled with either wooden or steel wheels; commonly this truck had bunks 9 ft wide that are spaced 10 ft apart center to center. The wheels were 4 ft 4 in diameter and the outside tread was 7 ft. The other was steel and had only 3 wheels. One wheel was located in the middle at the front (Berry 1917:45).

Turkey - A bag containing a lumberjack's outfit. To "histe the turkey" was to take one's personal belongings and leave camp (USDA 1905:52).

Undercut - The notch cut in a tree to determine the direction in which the tree was to fall, and to prevent splitting. Syn: notch, nick (USDA 1905:52).

Undercutter - A skilled woodman that chopped the undercut in trees so that they would fall in the proper direction (USDA 1905:52).

Van - The small storeroom in a logging camp in which clothing, tobacco and medicine were kept to supply the crew (USDA 1905:52).

XXXXb - A wood or steel device pounded into a log or tree to cause the tree to lean a direction and to split evenly.

Felling Wedges - Steel wedges weighing from 10 to 12 lbs (Berry 1917:14).

Bucking - Steel wedges weighing between 4 and 8 lbs (Berry 1917:14).

Whiffletree -

Whiffletree neck yoke - A heavy logging neckyoke, which had whiffletrees, attached to its ends by rings. From the ends of the whiffletrees wide straps ran to the breeching, giving the team added power in holding back loads on steep slopes (USDA 1905:52).

Widow maker - A broken limb hanging loose in the top of a tree, which in its fall might injure a man below, or break a cable causing severe injury to a logger.

Woodpecker - A poor chopper (USDA 1905:53).

Steam Yarding - The donkeys used in these kinds of yarding ranged from light Dolbeer or spool donkeys to heavy, powerful double-drum machines. They all operated on the same logs were hauled from the woods to the machine by wire rope. This wire rope was wound on a drum or spool, and the cable was returned to the woods by a horse or as small return cable [?] (Berry 1917:23; USDA 1905:53).

Overhead yarding - A three-drum engine was used, as well as a 12 by 4 in yarder equipped with a 1 1/2 in main or standing line. The usual distance between the spar tree and trill tree was 1,800 or 1,900 ft, but spans of 2,200 ft had been made. The carriage was operated on this standing line by a 1-in skidding line and a 3/4-in haulback. The best setting was on the point of a secondary ridge because the span could be made to cross a gulch or small canyon. The rig was used both for yarding and roading. For roading a yarder was stationed at the tail tree where he could yard for an additional 1,400 ft. Logs were hauled in one, two, and three log lengths, the average load being about 1,000 ft. A small donkey was stationed at the landing for hauling the logs in the bucking chute and loading. The average output for four summer months was 60,000 ft/day. Overhead yarding was first used in California sugar and yellow pine in 1913 (Berry 1917:34).

APPENDIX B

Site Characteristics and Research Potential

Site/Feature	Function	Characteristics	Research Potential
CHUTE	Transport (logs)	Shaped logs, cribbing (butt end down-slope), grease (including in cans), associated road, cables	Technology Environment Economics
DONKEY SETTING	Yarding	Flat rectangular area cables, old log deck	Technology Environment Economics
FLUME	Transport (lumber)	Slope planks, cribbing, ditch water source, reservoir	Technology Environment Economics
FLUME/CHUTE STATION	Transport (maintenance)	Structures, domestic trash, cleared area	Technology Environment Economics
GRADE	Transport (people, equipment, materials, logs)	Through cut, turnpike, spikes, ties, slag, rails, etc.	Technology Environment Economics
INCLINES	Transport (timber)	A linear feature consisting of a prepared surface, cable, large timbers, boards, etc.	Technology
LANDING	Yarding terminus	Flat feature (may have loading platform or deck)	Technology Environment Economics
MILL TOWN	Processing (timber)	Sawmill, housing, camping, cooking facility, millpond, grades, drying kilns. Location of central to operation.	Technology Environment Economic Social/Cultural
SECONDARY MILL	Processing (wood)	The location of a logging camp	Technology Environment Economics
SKIDWAYS/ROADS	Transport (logs)	Linear feature marking the course of a transport route for logs	Technology Environment Economics
SPUR CAMP	House, feed laborers	Leveled, cleared areas, dump, outhouse, etc.	Technology Environment Economics Social/Cultural
STUMPS	Harvesting (timber)	The butt ends of trees felled with a crosscut saw, felling axe, and later chain saw. The older ones may have springboard scars	Technology Environment
TRAMWAY	Transport (logs and lumber)	Cables, tram supports, cut and fill, boards, nails and spikes	Technology Environment Economics
TRESTLE	Transport (across draws and other geological features)	Terracing, round or milled timber, artifacts (bolts, including the above	Technology Environment Economics

APPENDIX C

Historical Railroad Logging as a Cultural Resource

By Jim McDonald

Introduction

Cultural resource inventories on many Forests in the Pacific Southwest Region have encountered abundant remains of historic railroad logging activities. There is skepticism on the part of many land managers as to the importance of these remains, and consequently there is some reluctance to manage them as cultural resources. Generally, objections to the significance of railroad logging remains fall into two categories: 1) that the time period or activities which they represent are well-recorded in the memories of living persons or in documents and photographs; and 2) railroad logging is too recent to be important.

Concerning the first objection, there are many instances where potential informants have died and documents have been lost through administrative "housecleaning". Even if many people remain alive and records are intact, they frequently disagree or are silent about important details of the past. In such instances, the physical remains of railroad logging may resolve conflicting accounts or supply missing data. In these cases, the result would be potentially important contribution to the study of history. Systematic comparison of data from oral history, documentary research and archaeology may reveal classes of data that are always more reliably obtained from one information source than from another.

The statement that railroad logging is too recent to be important focuses on an attribute of railroad logging that is irrelevant to any consideration of cultural importance. A central interest of disciplines involved in the study of human behavior (which include the cultural resource disciplines) is the identification and explanation of behaviors, which are the same in all, times and places. To say that recency of an activity makes it less important renders the disciplines, which study recent behavior (e.g., sociology, anthropology) trivial, and denies the relevance of disciplines, which focus on

past behavior (e.g., prehistory, history) by saying that while they are important, past behaviors are qualitatively different. The measures of the importance of an activity, such as railroad logging, are the quantity and quality of information that it can provide on human behavior in general. This paper will focus on kinds of information that studies of railroad logging might reveal, as a first step toward making assessments of the quantity and quality of information available in particular cases.

Railroad Logging as an Example of the Evolution of Technology

The most obvious characteristic of railroad logging is that it is a form of technology:

"What is most distinctive about technology viewed as a form of human cultural activity is the nature of its output and its general function, purpose, or objective? The ultimate output of technology consists of material products and procedural systems for the production, management, and use of material artifacts, and for the control and enhancement of other forms of human activity, created with a view toward expanding the realm of practical human possibility (Hannay and McGinn 1980: 26)."

The greatest potential contribution of studies of railroad logging is to the understanding of technology, its development, and its effects on the culture which produces it, a subject in which a great deal of interest and concern has recently been expressed (Brooks and others 1980).

Technology, like other forms of human activity, can be described in terms of six components (Hannay and McGinn 1980: 26):

1. Its output or products
2. Its function or functions
3. Its resources
 - A. Input resources
 - B. Internal or transforming resources
4. The processes by which the activity is carried out
5. The mental sets of its practitioners
6. Its social, cultural, and environmental context

Hannay and McGinn (1980: 28-47) characterize modern technology in terms of these six components. Because of the comprehensiveness of the characterization, it is an excellent source of hypotheses about technology in general or about particular technologies. Since railroad logging represents a step in the evolution of one particular modern technology, its study offers the potential for testing developmental implications of their statements and consequently their validity. Thus Hannay and McGinn's article has been used as the framework for the following discussion.

The products of modern technology: The products of modern technology are distinctive for their complexity, systemic context, ubiquity, relations to their users, content, and social effects. Complexity consists of a large number of parts, highly differentiated in nature and function and requiring extraordinary integrative mechanisms. The complexity of the products of modern technology is qualitatively different from the complexity of the products of premodern technology. The systemic context consists of the sociotechnical support systems required for the manufacture, use, and maintenance of items of modern technology (e.g., cars require road, energy supply, parts, maintenance, registration, insurance, police, and legal systems). Modern technology is more deeply embedded in these systems, and is not simply a larger collection of more complex objects. Ubiquity refers to the geographic and cultural distribution of the products of technology, which in the modern world is becoming global. The possible relationships between technological items and their users minimally consist of designer, maker, repairer, optimizer, and user/operator. In the past, these were often the same person. Presently, it is more common for an individual to be expert with respect to one category or subcategory of modern technology and to be a mere user of all others. Traditionally, the content of technology has consisted of material goods. Increasingly, technology also includes procedural systems (e.g., computer languages, organization theories). The effects of technology on society are impossible to adequately characterize in a concise manner, since if one adopts a cultural-materialist viewpoint they are all pervasive. There is general agreement, however, that the products of modern technology have permitted increased numbers of people, more complex social organizations, greater power over people and nature, and have produced a greater flow and transience of people, goods, and information within cultures.

Railroad logging might be related to these characterizations of the products of modern technology in two ways. The first is definitional: it might be used in increasing the specificity of the definition of a "modern" technology. For example, what is "complexity" in terms of the remains present on the ground? The second use of railroad logging would be to actually test Hannay and McGinn's characterizations. The products of railroad logging should be more "complex", more "ubiquitous", etc., than the products of animal logging. The products of truck logging should show these traits still more. Is that really the case? If not, why not?

The functions of modern technology: The function of technology was defined above as being expressed that technology has gone "too far". Hannay and McGinn (1980: 36) specifically mention concern over "the enormous increase in tree-felling abilities in methods used for clear-cutting forests". Study of railroad logging, especially those comparing it with other systems, could provide information on the "how much", "when", and "why" of this increase, and its actual effects.

Characteristics of modern resources - input resources: Input resources consist of the matter that is acted upon and transformed in the course of production. In the past, input resources usually consisted of basic raw materials obtained locally. In the modern world input resources are often already highly refined materials developed to have certain desired physical properties, and are obtained from around the world. The use of modern input resources involves dynamic relationships between several conflicting developments: globalization (expansion of the geographic area from which input resources are obtained), fragility of access to resources (due to political instability, or the creation of cartels by those who control the inputs), technological interdependence (establishment of relationships to exchange input resources and products), and internalization (attempts to develop internal supplies of resources). Can railroad logging be treated as a microcosm, illustrating the pattern of technology as a whole? If not, why not? What balances were struck between "fragility of access" and "internalization" in specific systems? Are the balances between forces controlling the use of input resources found in railroad logging different from the balances struck in other logging systems?

Characteristics of modern resources - transforming resources:

Transforming resources are those resources which are used to transform input resources into products. Examples are energy, tools, labor, capital, and knowledge. The physical transforming resources (e.g., energy sources) are characterized in modern technology by the increasing role of machinery over tools and labor power, the growth of automated production processes, and changes in typical energy sources (coal, electric, and nuclear over animal, water, wood, and human muscles). On the face of it, railroad logging seems anomalous in at least one of these respects. When compared with truck logging, it is not clear that it manifests a lesser role for machinery. Does it?

Characteristic features of modern technology processes: Modern technological processes are marked by separation of the roles of designer, manufacturer, operator, and maintainer. At the same time, the focus of research and development has moved from the individual workshop to a corporate plant, laboratory or headquarters. Can comparison of railroad logging with earlier and later logging systems provide quantitative measures of this, perhaps by examining proportions and types of handmade artifacts to mass-produced artifacts?

Characteristic mental sets of the practitioners of modern technology: Hannay and McGinn (1980: 40-41) note that:

"It is difficult to ascertain if or how the consciousness of practitioners of modern technology differs from that of its premodern predecessors. Whether premodern engineers were more or less efficiency - or cost-conscious - or more or less mindful to aesthetic and environmental considerations in their work is difficult to determine."

Early logging in general and railroad logging in particular are often characterized as extremely cost-conscious and minimally considerate of environmental effects. Study of the logging systems in the field should provide some objective measure of these characterizations, by providing evidence of where and how activities were actually conducted, and by comparing this evidence with historic and modern engineering standards.

The social, cultural, and environmental context of modern technology: Technology is conditioned by the social, cultural, and environmental matrix in

which it develops. Many of the influences are rather obvious, e.g., governments may regulate business and industry, particular environmental conditions may spur development of an adaptive technology, consumers influence technology through purchases, etc. Some of the influences may not be as obvious, however, as an example provided by Langdon Winner (1980: 124-125) points out:

"At Cyrus McCormick's reaper manufacturing plant in Chicago in the middle 1880s, pneumatic molding machines, a new and largely untested innovation, were added to the foundry at an estimated cost of \$500,000. In the standard economic interpretation of such things, we would expect that this step was taken to modernize the plant and achieve the kind of efficiencies that mechanization brings."

However, "At the time, Cyrus McCormick II was engaged in a battle with the National Union of Iron Molders. He saw the addition of the new machines as a way to 'weed out the bad element among the men', namely, the skilled workers who had organized the union local in Chicago. The new machines, manned by unskilled labor, actually produced inferior castings at a higher cost than the earlier process. After three years of use the machines were, in fact, abandoned, but by that time they had served their purpose - destruction of the union."

This is an excellent example of the impacts of society on technology and vice versa. Given that the era of railroad logging included periods in which intensive efforts were made to unionize woods crews, perhaps similar examples of "maladapted" (from a strictly engineering standpoint) technology can be found. Comparison of actual to "ideal" (as defined by engineering or silvicultural criteria) should enable the development of statements about the relative influence of social, cultural, and environmental forces in different times and places, as well as providing insight into the mental sets of the practitioners of railroad logging.

Conclusion

The recency of railroad logging is actually a positive factor in relating it to important historical patterns. In many areas it was the immediate predecessor of modern logging technology, and study of it may be highly

informative in establishing definitions of "modern" technological systems, and in describing the interrelationships of modern technology, society, culture, and environment. The next step in this process is the definition of specific artifactual correlates of the characteristics of modern technology discussed in this paper.

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Winner, Langdon

1980 Do artifacts have politics? *Daedalus: Proceedings of the American Academy of Arts and Sciences* 109(1): 121-136.

APPENDIX D

Archival Sources

1. Forest Service timber atlases and records of past sales
2. Forest Service land classification records
3. Government Land Office records
4. Topographic and soil maps
5. Aerial photographs
6. Work Project Act (WPA) California logging abstracts
7. State Land Division records
8. Tax records and other county records
9. Legal documents
10. Newspapers
11. Trade and industry catalogues, directories, and journals
12. Economic analysis reports and books
13. Company records (purchase and activity)
14. Museum and historical society records, photographs, and data (e.g., Forest History Society, local historical societies)
15. Popular secondary sources (literature)
16. Informant (oral history) data
17. Personal journals and diaries

18. Libraries, in particular those with historical sections
19. Public utilities and commission records (Railroad Commission, California State Archives includes reports, maps, etc.)

APPENDIX E

RAILROAD LOGGING SYSTEMS ON PACIFIC SOUTHWEST REGION FORESTS

Dates when railroad logging began and ended

ELDORADO

California Door Company	1901-Late 1950s
Eldorado Lumber Company/	Late 1890s-Late 1940s
Michigan California Lumber Company	
Gardner	1875-1885

INYO

Bodie Railroad and Lumber Company	1881-1882
Bodie and Benton Railway and Company	1882-1893
Bodie Railway and Lumber Company	1893-1906
Mono Lake Railway and Lumber Company	1906-1908
Mono Railway Company/Mono Lake Lumber Company	1908-1917

KLAMATH

Moon Lumber Co.	1921-1923
Kespine Lumber Co.	1922-
Weed Lumber Company/	1901-1926
Long Bell Lumber Company	1926-1956
Northern California Lumber Company/	1906-1909
Fruit Growers Supply Company	1909-1933
McCloud River Lumber Company	1897-1955
J.R.Cook and Sons Logging Railroad/	1892-1900
Klamath Lake Railroad	1901-1912
Johnson - Pollock	1913-1919
Siskiyou Lumber Company	1923-1929
Nine Lumber Company	1915-1917
Mount Hebron Lumber Company	1910-1926
Dwinnel/Peppers-Cotton	
(American Fruit Grower's Inc.)	1909-1920, 1920-1922
Standard (Pickering) Lumber Company	1923-1927
Hovey and Walker	1929-

Pickering Railroad 1915-

LASSEN

California and Oregon Railroad	1870-?
Sierra Lumber Company	1881-?
Red River Lumber Company	1912-1958
Western Pacific High Line	1913-1950s
Fruit Growers Supply Company	1920-
Lassen Lumber and Box Company	1923-

MENDOCINO

Prather	1919-1954
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MODOC

Long Bell Lumber Company	1926-1956
McCloud River Lumber Company	1897-1955
Crane Creek Lumber Company	1927-1929
Big Lake Box Company	1930s-1948

SIX RIVERS

Little River Railroad	1908-1910
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PLUMAS

Western Pacific	1905-
present	
Great Western Power Companyca.	1925-1929
Pacific Power and Gas	1927-mid 1930s
Sierra and Mohawk	1911-1915
N.C.O. Control	1900-1911
Sierra Valley Railroad	1894-1911
Sierra Valley and Mohawk	1885-1887
Boca and Loyalton Railroad	1900-1916
Horton Brothers Logging Railroad	1902-1908
Western Pacific	1903-
Cliocoio Lumber Company	1907-1914
Quincy and Eastern Railroad/	1908-1909
Quincy Western/	1909-1914
Quincy Railroad	1917-present

March Company Railroad	1908-1920
Almanor Railroad (Red River Lumber Co.)	1914-1944
Red River Railroad	1914-1944
Feather River Lumber Company Railroad	1915-1943
F.S.Murphy Lumber Company/	1919-1926
Quincy Lumber Company	1926-1955
Gray Eagle/Davies Box and	1916-1919
Lumber Company/California Fruit	
Exchange	1919-1937
Clover Valley Lumber Company Railroad	1917-1940
Swayne Lumber Company (also)	
Butte and Plumas Railroad	1917-1940
Massack Timber and Lumber Company/	1921-1923
M.J. Scanlon Lumber Company	1923-1926
Nibbley-Stoddard Lumber Co. Railroad	1922-1936
Stone and Webster Construction Railroad	
(Carabou Operation)	early 1920s
Storrie Operation (Part of Bucks Lake	late 1920s
project) Bucks Dam Project	early 1930s
Spanish Peak Lumber Railroad Company/	1926-1935
Meadow Valley	1935-1953
Towle Brothers Lumber Railroad	1920s?
Northern California Railroad	1927
Feather River Short Line	1958
Leach Narrow Gaugeca.	1870-1880s?

SAN BERNARDINO

Brookings Logging Company	1901-1912
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SEQUOIA

Hume Bennett	1905-1917
Kings River Lumber Company	1882-1894
Sanger Lumber Company	1894-1905
Sanger Lumber Company	1917-1918

SHASTA-TRINITY

McCloud River Lumber Company	1897-1955
Weed Lumber Company/	1901-1926

Long Bell Lumber Company	1926-1956
Castle Lake Lumber Company/	1909-1912
M.A. Burns Lumber Company	1912-1919
Castle Crag Lumber Company	1920-1928
LaMoine Lumber and Trading Company	1900-1927
Sisson Mill and Lumber Company/	1896-1914
Rainbow Mill and Lumber Company/	1914-1923
Pioneer Box and Lumber Co.	1923-?
Red Cross?	
Terry Lumber Co.	
J.N.Durney (Leased by Mr. Penoyer)	1900-1920
Northern California Lumber Co.	
Samuel Coggins	1894-1905

SIERRA

Yosemite Lumber Company	1912-1918
Madera Flume & Trading Co.	1889-1892
Madera Sugar Pine Co.	1900?-1931
Fresno Flume & Irrigation Co./	1902-1912
Fresno Flume & Lumber Co./	1912-1924
Shaver Lake Lumber Co.	1915-1926
Sugar Pine Lumber Co.	
(Minarets & Western Railway)	1923-1931

STANISLAUS

Yosemite Lumber Co./	1912-1935
Yosemite Sugar Pine Lumber Co.	1935-1942
Yosemite Valley R.R.	1902-1942
Standard Lumber Co./	1903-1921
Pickering Lumber Co.	1921-1965
West Side Lumber Co.	1900-1960
Empire City Railway	1906-1913
California Peach and Fig Growers Railroad	1919-1925

TAHOE

Pacific Lumber and Wood Co.	1870-1901
Towle Brothers	1878-1902
Bierce and Smart	1885?-1895?

Read Lumber Company	1902-1918?
Sierra Nevada Wood Lumber Co.	
Lumber Company (later Hobart Estate)	1897-1936
Verdi Lumber Company	1905-1927
Davies-Johnson Lumber Company	1919-1939
Clover Valley Lumber Company	1917-1957
Truckee Lumber Company	1873-?
Boca - Loyalton	1901-1916
Crown Columbia Paper Company	1920s-1930s
TOIYABE	
Carson and Tahoe Lumber and Flume Company	1874-1897
Sierra Nevada Wood and Lumber Company	1881-1896

APPENDIX F

Procedure for Recording Historic Railroad Logging Properties

The purpose of this Appendix is to provide guidelines and recommendations for standard procedures used in recording historic railroad logging properties located on national forest lands. In the past railroad logging properties have been recorded in a variety of manners resulting in a general lack of consistency and difficulty in making inter and intra-site comparisons. For the purposes of this discussion railroad logging properties consist of both archaeological sites and features and historic standing physical remains. The differences in approach between historians and archaeologists have been widely discussed --both sides agreeing that a mutual approach is the most beneficial.

An immediate problem is the standardized archaeological site form. At present the Forest Service has not developed a site form that incorporates the appropriate archaeological data with the necessary historical information. There are several ways to approach this problem. The first is to develop individual archaeological/historic site records for thematic properties, such as railroad logging. The second approach is to develop a single site record that incorporates both archeological and historic questions on a broad enough level to deal with all historic/archeological properties. The Region in the past has chosen to develop individual archaeological/historic supplements to the main site record for thematic properties, such as railroad logging, fire lookouts, administrative building, and mining. Because each thematic group of properties is unique within itself, it is believed for the time this is the most effective approach. Therefore, attached to this report is a proposed Historic Railroad Logging Site Record Form Supplement.

Several other problems have emerged during fieldwork; the first is deciding what denotes a feature from a site and the second how should a feature be recorded versus a site. In the past most fieldwork carried out in the Region has been on a project-by-project basis, therefore, only portions of railroad logging properties are recorded at a time. In a number of cases this approach has been circumvented by holistic studies of the entire system or

systems (see Brown and Elling). An Overview of Redwood Logging Resources within the Hume Lake Ranger District, Sequoia National Forest (1981); Baker and Shoup. An Historical and Archaeological Study of the M.A. Burns and Castle Crag Lumber Companies, Shasta-Trinity National Forest (1979); Henn and Vaughan. National Register Nomination of the LaMoine Lumber and Trading Company Railroad Logging System

Shasta-Trinity National Forest (1980); Pam Conners. West Side Eligibility and Preliminary Case Report (1986); Shoup. An Historical Overview of the Feature River and Truckee Lumber Companies (1985). Naturally, this is the best approach to take, but with well-over 100 logging companies once operating within the national forests, these studies represent a fraction of that total.

Using this design as a model (see Appendix B), certain properties have certain distinctive characteristics and have varying degrees of research potential. For example, in its simplest form, a linear area of fill, or a cut, with various artifacts, characterizes a logging grade at the feature or nearby, such as spikes, rails, ties, slag, etc. The function of a grade was to transport people, equipment, raw and finished products to and from a particular location. In general terms its research potential then lies in the domains of Technology, the Environment, and Economics. In more specific terms the characteristics and location of a grade provide information about existing technology, the spatial relationship of the system, construction costs, and capabilities, in terms of the inputs and outputs (see page). Thus, information recorded in the field should take into account these research areas. For most grades plotting their location, noting the related features, and artifacts is sufficient. The significance (see Appendix I) of a grade or series of grades is dependent upon the information they can provide to our knowledge of railroad logging and their integrity--which relates to the commemorative or interpretive value of the grade.

More complex properties, such as secondary mill camps, or company towns, require more fieldwork, but again the degree of recordation should be related to the information that the property may reveal. Determining the significance of such properties will again rely upon the property's information potential, integrity, and its interpretive or commemorative value.

Capturing a properties "information value" can be done through the use of archival and oral sources. If, for example, a detailed map exists of a logging camp or company town, it may simply be necessary to verify its reliability in the field and assess the potential for scientific (archaeological) research.

Currently, a number of scholarly historical overviews have been completed for railroad logging systems in California. Those overviews should provide the context to make decisions regarding the intensity of recordation. Those documents should be examined to determine what gaps or problems still exist in understanding the history of a particular railroad logging system and what additional work is required to fill those gaps.

Once a system or thematic group of properties has been recorded and the appropriate archival and oral histories documented, the evaluation process can begin. This is the topic of Appendix I.

APPENDIX G

A Model for Evaluating the Significance of RR Logging Properties

The purpose of this Appendix is present a model for evaluating the significance of railroad logging properties. If this Research Design could be implemented sequentially, then the Evaluation phase would come next to last, but should be considered a critical element of any cultural resource management program. To date, similar procedures have been followed adopting similar criteria, but no "model" for standardizing evaluative approaches has emerged. Rather than consistency in approach, there has been a "lack of consistency". This is not to say that one approach is right or wrong, but only that the outcome varies, depending upon each observers own bias or slant. The reduction of bias is only part of the problem, the other relates to inconsistencies in management and treatment of individual properties.

As noted in Appendix F, a number of important system-wide studies have been completed from the northern to the southern forests. Combined, these studies provide a wide syntheses of information related to railroad logging in California. Not only does this work have implications for Agency use, but its distribution to the public in the form of a publication has merit.

Determining the significance of any property requires an understanding of the property's history. This demands knowledge of the local as well as the broader historical processes that affected a property. The application of National Register criteria as defined in the National Park Services Handbooks are useful, but not always applicable to rural landscapes, linear features, or complex-thematic groups of properties. The criteria assume if a properties historical context is established then its level of significance can be determined, that is whether it has local, state, or national significance.

Ironically, many railroad-logging systems were never intended as permanent. Their use was immediate, and few logging companies considered their systems would be immortal. The choices they made, such as certain wood for trestles and ties dictated the life of that feature. The paradox then becomes, if this viewpoint was intrinsic to railroad logging, then for those who study society and its related technologies, the remains of those systems become all the more important today. What effect does this change in values have upon the management of historical properties? Should cultural resource managers consider the original purpose or values of the society their studying before making decisions regarding preservation and commemoration?

More fundamental is the seemingly obvious question, what information can this study provide? If there is a general agreement that railroad logging is a significant cultural and physical phenomenon, then it follows that new information relating to its intricacies are paramount to any scholarly study. If the historical context of a particular system is understood, then the important questions should emerge from that study. If the physical remains of that system offer little or no new information about those important questions, then it may not be necessary to consider further treatment of that property, unless there are commemorative values associated with the property.

In the advanced stages of any study, it should become evident if any commemorative values exist in the local community. How much weight to place upon this criterion is entirely up to the individual and the unit carrying out the study? Thus far, this Agency has not been notified by any organized interest group solely for the purpose of preserving railroad logging systems.

Most railroad organizations, although interested, are neither prepared nor oriented toward rural railroad logging properties. Most of the authors of railroad logging literature, and there are many, capture their topic in words, rather than in physical preservation.

It is hoped that this research design clearly establishes that railroad-logging properties in California are "associated with events that have made a significant contribution to the broad patterns of our history" (Criterion A of National Register). If, as Cultural Resource Managers, we can agree that railroad logging properties meet this basic test, then determinations of eligibility should concentrate on the information level of each property, its architectural distinctiveness, and its integrity.

Think of integrity as a test of the properties physical remains to provide important information, articulate distinguishable architectural forms, and provide a sense of that cultural phenomenon. The National Register defines integrity in seven ways: location, design, setting, materials, workmanship, feeling, and association. Therefore, if a particular property already meets Criterion A, as has already been established, then if that property retains integrity it should be considered potentially eligible. Only when SHPO State Historic Preservation Office and the Keeper of the Register concur, does a property obtain its National Register Landmark status.

One of the purposes for a holistic approach using a research design as the focal point is to distinguish between high-level and low-level properties. This can only be done using a thematic approach viewing properties on a regional basis. To elaborate on this process, one hypothetical example may help illustrate this approach.

On the Big Sky National Forest three railroad logging systems have been identified, all of which were operated by a variety of companies between 1890 and 1920. Before any fieldwork is done an archival and oral search for information is completed and the important research questions are defined. One of the questions relates to economics, another to social/cultural. Fieldwork is then carried out keeping in mind these important questions. Many features and individual sites are noted and recorded, but only three of these sites and features have the potential to provide information about these questions. For social/cultural it was identified through oral and

archival sources that Chinese were used extensively in grade and track construction, and there was reported that several Chinese camps existed. The archival record and oral record revealed little more than the possible locations and that Chinese worked as laborers. During the course of the fieldwork a temporary camp consisting of Chinese artifacts was located. Since it has been established that the information value of this site is high, and the site appears to have the integrity necessary to provide this information, then eligibility is assumed and specific treatment measures can be followed. In the case of the other sites and features, some were redundant, while others had low integrity, but as a whole they offered little or no new information and had no distinguishable architectural forms. Thus non-eligibility is recommended and much different treatment alternatives should be applied. These types of sites or features may be considered low level.

Properties should not be considered eligible simply because they meet the basic tests established by the National Register Criteria. These criteria are only screening methods and different properties may require special screening measures. This is particularly true with linear features, rural landscapes, and complex thematic groups of properties.

The attached flow chart illustrates the entire process sequentially from the development of the contextual history to site recordation and treatment options.